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1.4 ehcache 3.8.1

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org.ehcache.jsr107.internal.Jsr107CacheConfigurationParser

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- * /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/InvocationScopedEventSink.java
- * /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/config/ResourceUnit.java
- * /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/Jsr107Cache.java
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* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/config/EvictionAdvisor.java

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* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/SourceStatistic.java
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1.5 libidn 2.2.0 2

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1.7 popt 1.16

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*/

/* checkTag : validation tool for libzstd

* command :

* \$./checkTag tag

* checkTag validates tags of following format : v[0-9].[0-9].[0-9]{any}

* The tag is then compared to zstd version number.

* They are compatible if first 3 digits are identical.

* Anything beyond that is free, and doesn't impact validation.

* Example : tag v1.8.1.2 is compatible with version 1.8.1

* When tag and version are not compatible, program exits with error code 1.

* When they are compatible, it exists with a code 0.

* checkTag is intended to be used in automated testing environment.

*/

1.9 free-type 2.5.5

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```

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```

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1.10 gmp 6.2.0+dfsg-4

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1.11 latencyutils 2.0.3

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1.12 linux-kernel 4.4.225

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Contributors to bttv:

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AverMedia fix and more flexible card recognition

Alan Cox <alan@lxorguk.ukuu.org.uk>
Video4Linux interface and 2.1.x kernel adaptation

Chris Kleitsch
Hardware I2C

Gerd Knorr <kraxel@cs.tu-berlin.de>
Radio card (ITT sound processor)

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```
/* nicstar.c v0.22 Jawaid Bazyar (bazyar@hypermall.com)
* nicstar.c, M. Welsh (matt.welsh@cl.cam.ac.uk)
*
* Hacked October, 1997 by Jawaid Bazyar, Interlink Advertising Services Inc.
* http://www.hypermall.com/
* 10/1/97 - commented out CFG_PHYIE bit - we don't care when the PHY
* interrupts us (except possibly for removal/insertion of the cable?)
* 10/4/97 - began heavy inline documentation of the code. Corrected typos
* and spelling mistakes.
* 10/5/97 - added code to handle PHY interrupts, disable PHY on
* loss of link, and correctly re-enable PHY when link is
* re-established. (put back CFG_PHYIE)
*
* Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.
*
* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997
*
* Linux driver for the IDT77201 NICStAR PCI ATM controller.
* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;
* see init_nicstar() for PHY initialization to change this. This driver
* expects the Linux ATM stack to support scatter-gather lists
* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.
*
```

```

* Implementing minimal-copy of received data:
* IDT always receives data into a small buffer, then large buffers
* as needed. This means that data must always be copied to create
* the linear buffer needed by most non-ATM protocol stacks (e.g. IP)
* Fix is simple: make large buffers large enough to hold entire
* SDU, and leave <small_buffer_data> bytes empty at the start. Then
* copy small buffer contents to head of large buffer.
* Trick is to avoid fragmenting Linux, due to need for a lot of large
* buffers. This is done by 2 things:
* 1) skb->destructor / skb->atm.recycle_buffer
*    combined, allow nicstar_free_rx_skb to be called to
*    recycle large data buffers
* 2) skb_clone of received buffers
* See nicstar_free_rx_skb and linearize_buffer for implementation
* details.
*
*
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* Foundation, Inc., 675 Mass Ave, Cambridge, MA 02139, USA.
*
* M. Welsh, 6 July 1996
*
*
*/

```

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for the initial saa7146 driver and its recent overhaul

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for his work on the initial Linux DVB driver

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Ralph Metzler <rjkm@metzlerbros.de>
for their continuing work on the DVB driver

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for his contributions to the dvb-net driver

Diego Picciani <d.picciani@novacomp.it>
for CyberLogin for Linux which allows logging onto EON
(in case you are wondering where CyberLogin is, EON changed its login procedure and CyberLogin is no longer used.)

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Andreas Oberritter <obi@linuxtv.org>
Dennis Noermann <dennis.noermann@noernet.de>
Felix Domke <tmbinc@elitedvb.net>
Florian Schirmer <jolt@tuxbox.org>
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for the nxt2004 frontend driver

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for the or51211 and or51132 frontend drivers, and
for merging the nxt2002 and nxt2004 modules into a
single nxt200x frontend driver.

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.gitignore

#

builds/unix/pkg.m4

#

docs/FTL.TXT

docs/GPLv2.TXT

#

include/freetype/internal/fthash.h

#

src/base/fthash.c

src/base/md5.c

src/base/md5.h

#

src/bdf/bdf.c

src/bdf/bdf.h

src/bdf/bdfdrivr.c

src/bdf/bdfdrivr.h

src/bdf/bdferror.h

src/bdf/bdflib.c

src/bdf/module.mk

src/bdf/README

src/bdf/rules.mk

#

src/pcf/module.mk

src/pcf/pcf.c

src/pcf/pcf.h

src/pcf/pcfdrivr.c

src/pcf/pcfdrivr.h

src/pcf/pcferror.h

src/pcf/pcfread.c

src/pcf/pcfread.h

src/pcf/pcfutil.c

src/pcf/pcfutil.h

src/pcf/README

```
src/pcf/rules.mk
#
src/gzip/adler32.c
src/gzip/infblock.c
src/gzip/infblock.h
src/gzip/infcodes.c
src/gzip/infcodes.h
src/gzip/inffixed.h
src/gzip/inflate.c
src/gzip/inftrees.c
src/gzip/inftrees.h
src/gzip/infutil.c
src/gzip/infutil.h
src/gzip/zconf.h
src/gzip/zlib.h
src/gzip/zutil.c
src/gzip/zutil.h
#
src/tools/apinames.c
src/tools/ftrandom/ftrandom.c
#
# EOF
```

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1.14 speex 1.2

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1.16 ipmi-tool 1.8.18

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1.17 libusrctp 1.0

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1.18 freerdp 2.0.0-rc4

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1.19 libffi 3.2.1

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1.20 @tensorflow/tfjs 3.11.0

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1.21 spring-jcl 5.2.8.RELEASE

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@subheading END OF TERMS AND CONDITIONS

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@var{signature of Ty Coon}, 1 April 1990

Ty Coon, President of Vice

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1.25 libffi 3.3 4

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1.26 python-requests 2.25.1

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1.27 hd-parm 9.38

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1.28 goprotobuf 2.4.1

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1.29 linux-kernel 4.4.245

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Contributors to bttv:

Michael Chu <mmchu@pobox.com>

AverMedia fix and more flexible card recognition

Alan Cox <alan@lxorguk.ukuu.org.uk>

Video4Linux interface and 2.1.x kernel adaptation

Chris Kleitsch

Hardware I2C

Gerd Knorr <kraxel@cs.tu-berlin.de>

Radio card (ITT sound processor)

bigfoot <bigfoot@net-way.net>

Ragnar Hojland Espinosa <ragnar@macula.net>

ConferenceTV card

+ many more (please mail me if you are missing in this list and would like to be mentioned)

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Appendix: How to Apply These Terms to Your New Libraries

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<signature of Ty Coon>, 1 April 1990

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/* nicstar.c v0.22 Jawaid Bazyar (bazyar@hypermall.com)

* nicstar.c, M. Welsh (matt.welsh@cl.cam.ac.uk)

*

* Hacked October, 1997 by Jawaid Bazyar, Interlink Advertising Services Inc.

* <http://www.hypermall.com/>

* 10/1/97 - commented out CFG_PHYIE bit - we don't care when the PHY

* interrupts us (except possibly for removal/insertion of the cable?)

* 10/4/97 - began heavy inline documentation of the code. Corrected typos

* and spelling mistakes.

* 10/5/97 - added code to handle PHY interrupts, disable PHY on

* loss of link, and correctly re-enable PHY when link is

* re-established. (put back CFG_PHYIE)

*

* Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.

*

* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997

*

* Linux driver for the IDT77201 NICStAR PCI ATM controller.

* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;

* see init_nicstar() for PHY initialization to change this. This driver

* expects the Linux ATM stack to support scatter-gather lists

* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.

*

* Implementing minimal-copy of received data:

* IDT always receives data into a small buffer, then large buffers

* as needed. This means that data must always be copied to create

* the linear buffer needed by most non-ATM protocol stacks (e.g. IP)

* Fix is simple: make large buffers large enough to hold entire

* SDU, and leave <small_buffer_data> bytes empty at the start. Then

* copy small buffer contents to head of large buffer.

* Trick is to avoid fragmenting Linux, due to need for a lot of large

* buffers. This is done by 2 things:

* 1) skb->destructor / skb->atm.recycle_buffer

* combined, allow nicstar_free_rx_skb to be called to

* recycle large data buffers

* 2) skb_clone of received buffers

* See nicstar_free_rx_skb and linearize_buffer for implementation

* details.

*
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*
* M. Welsh, 6 July 1996
*
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Dennis Noermann <dennis.noermann@noernet.de>
Felix Domke <tmbinc@elitedvb.net>
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single nxt200x frontend driver.

(If you think you should be in this list, but you are not, drop a
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*/

package io.swagger.annotations;

import java.lang.annotation.ElementType;

import java.lang.annotation.Retention;

import java.lang.annotation.RetentionPolicy;

import java.lang.annotation.Target;

/**

* License metadata available within the info section of a Swagger definition, see

* <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/2.0.md#licenseObject>

*

* @since 1.5.0

*/

@Target(ElementType.ANNOTATION_TYPE)

@Retention(RetentionPolicy.RUNTIME)

public @interface License {

/**

* The name of the license.

*

* @return the name of the license

*/

String name();

/**

```
* An optional URL for the license.  
*  
* @return an optional URL for the license.  
*/  
String url() default "";  
}
```

1.32 lombok 1.18.12

1.32.1 Available under license :

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1.33 python 3.7.3

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In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations, which became Zope Corporation. In 2001, the Python Software Foundation (PSF, see <https://www.python.org/psf/>) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation was a sponsoring member of the PSF.

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1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

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+-----+				
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+-----+				
2.1.2	2.1.1	2002	PSF	yes
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Mersenne Twister

The `:mod:`_random`` module includes code based on a download from <http://www.math.sci.hiroshima-u.ac.jp/~m-mat/MT/MT2002/emt19937ar.html>. The following are the verbatim comments from the original code::

A C-program for MT19937, with initialization improved 2002/1/26.
Coded by Takuji Nishimura and Makoto Matsumoto.

Before using, initialize the state by using `init_genrand(seed)`
or `init_by_array(init_key, key_length)`.

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<http://www.math.sci.hiroshima-u.ac.jp/~m-mat/MT/emt.html>

email: m-mat @ math.sci.hiroshima-u.ac.jp (remove space)

Sockets

The `:mod:`socket`` module uses the functions, `:func:`getaddrinfo``, and
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Asynchronous socket services

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UUencode and UUdecode functions

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Modified by Jack Jansen, CWI, July 1995:

- Use `binascii` module to do the actual line-by-line conversion between `ascii` and `binary`. This results in a 1000-fold speedup. The C

- version is still 5 times faster, though.
- Arguments more compliant with Python standard

XML Remote Procedure Calls

The `:mod:`xmlrpc.client`` module contains the following notice::

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SipHash24

The file :file:`Python/pyhash.c` contains Marek Majkowski's implementation of Dan Bernstein's SipHash24 algorithm. The contains the following note::

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Original location:

<https://github.com/majek/csiphash/>

Solution inspired by code from:

Samuel Neves (supercop/crypto_auth/siphash24/little)

djb (supercop/crypto_auth/siphash24/little2)

Jean-Philippe Aumasson (<https://131002.net/siphash/siphash24.c>)

strtod and dtoa

The file :file:`Python/dtoa.c`, which supplies C functions dtoa and strtod for conversion of C doubles to and from strings, is derived from the file of the same name by David M. Gay, currently available from <http://www.netlib.org/fp/>. The original file, as retrieved on March 16, 2009, contains the following copyright and licensing notice::

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cfuhash

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1.35 zlib 1.2.11.dfsg-2ubuntu1.1

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1.37 spring-context-support 5.2.8.RELEASE

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```

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```
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/JCacheCache.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/caffeine/CaffeineCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/ehcache/EhCacheCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/config/AbstractJCacheConfiguration.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/JCacheCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/caffeine/CaffeineCache.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/commonj/WorkManagerTaskExecutor.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/ehcache/EhCacheCache.java
```


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#####
```

```
#####  
#  
# Defaults for the Java Activation Framework (revised).  
#  
# Modified extensions registered in this file:  
# text/plain java c c++ cpp pl cc h  
# image/png png  
# image/svg+xml svg  
#  
#####
```

```
text/html html htm HTML HTM  
text/plain txt text TXT TEXT java c c++ cpp pl cc h  
image/gif gif GIF  
image/ief ief  
image/jpeg jpeg jpg jpe JPG  
image/tiff tiff tif  
image/x-xwindowdump xwd  
application/postscript ai eps ps  
application/rtf rtf  
application/x-tex tex  
application/x-texinfo texinfo texi  
application/x-troff t tr roff  
audio/basic au  
audio/midi midi mid  
audio/x-aifc aifc  
audio/x-aiff aif aiff  
audio/x-mpeg mpeg mpg  
audio/x-wav wav  
video/mpeg mpeg mpg mpe
```

video/quicktime qt mov
video/x-msvideo avi

#####

#

Additional file types adapted from

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#

#####

TEXT TYPES

text/x-speech talk

text/css css

text/csv csv

IMAGE TYPES

X-Windows bitmap (b/w)

image/x-xbitmap xbm

X-Windows pixmap (8-bit color)

image/x-xpixmap xpm

Portable Network Graphics

image/png png

Scalable Vector Graphics

image/svg+xml svg

Image Exchange Format (RFC 1314)

image/ief ief

RGB

image/rgb rgb

Group III Fax (RFC 1494)

image/g3fax g3f

X Windowdump format

image/x-windowdump xwd

Macintosh PICT format

image/x-pict pict

PPM (UNIX PPM package)

image/x-portable-pixmap ppm

PGM (UNIX PPM package)

image/x-portable-graymap pgm

PBM (UNIX PPM package)

image/x-portable-bitmap pbm

PNM (UNIX PPM package)

image/x-portable-anymap pnm

Microsoft Windows bitmap

image/x-ms-bmp bmp

CMU raster

```

image/x-cmu-raster ras
# Kodak Photo-CD
image/x-photo-cd pcd
# Computer Graphics Metafile
image/cgm cgm
# CALS Type 1 or 2
image/x-cals mil cal
# Fractal Image Format (Iterated Systems)
image/fif fif
# QuickSilver active image (Micrografx)
image/x-mgx-dsf dsf
# CMX vector image (Corel)
image/x-cmx cmx
# Wavelet-compressed (Summus)
image/wavelet wi
# AutoCad Drawing (SoftSource)
image/vnd.dwg dwg
# AutoCad DXF file (SoftSource)
image/vnd.dxf dxf
# Simple Vector Format (SoftSource)
image/vnd.svf svf

# AUDIO/VOICE/MUSIC RELATED TYPES

# ""basic""audio - 8-bit u-law PCM"
audio/basic au snd
# Macintosh audio format (AIpple)
audio/x-aiff aif aiff aifc
# Microsoft audio
audio/x-wav wav
# MPEG audio
audio/x-mpeg mpa abs mpega
# MPEG-2 audio
audio/x-mpeg-2 mp2a mpa2
# compressed speech (Echo Speech Corp.)
audio/echospeech es
# Toolvox speech audio (Voxware)
audio/voxware vox
# RapidTransit compressed audio (Fast Man)
application/fastman lcc
# Realaudio (Progressive Networks)
application/x-pn-realaudio ra ram
# MIDI music data
x-music/x-midi mmid
# Koan music data (SSeyo)
application/vnd.koan skp
# Speech synthesis data (MVP Solutions)
text/x-speech talk

```

VIDEO TYPES

MPEG video

video/mpeg mpeg mpg mpe

MPEG-2 video

video/mpeg-2 mpv2 mp2v

Macintosh Quicktime

video/quicktime qt mov

Microsoft video

video/x-msvideo avi

SGI Movie format

video/x-sgi-movie movie

VDOLive streaming video (VDOnet)

video/vdo vdo

Vivo streaming video (Vivo software)

video/vnd.vivo viv

SPECIAL HTTP/WEB APPLICATION TYPES

Proxy autoconfiguration (Netscape browsers)

application/x-ns-proxy-autoconfig pac

Netscape Cooltalk chat data (Netscape)

x-conference/x-cooltalk ice

TEXT-RELATED

PostScript

application/postscript ai eps ps

Microsoft Rich Text Format

application/rtf rtf

Adobe Acrobat PDF

application/pdf pdf

Maker Interchange Format (FrameMaker)

application/vnd.mif mif

Troff document

application/x-troff t tr roff

Troff document with MAN macros

application/x-troff-man man

Troff document with ME macros

application/x-troff-me me

Troff document with MS macros

application/x-troff-ms ms

LaTeX document

application/x-latex latex

Tex/LateX document

application/x-tex tex

GNU TexInfo document

application/x-texinfo texinfo texi
TeX dvi format
application/x-dvi dvi
MS word document
application/msword doc DOC
Office Document Architecture
application/oda oda
Envoy Document
application/envoy evy

ARCHIVE/COMPRESSED ARCHIVES

Gnu tar format
application/x-gtar gtar
4.3BSD tar format
application/x-tar tar
POSIX tar format
application/x-ustar ustar
Old CPIO format
application/x-bcpio bcpio
POSIX CPIO format
application/x-cpio cpio
UNIX sh shell archive
application/x-shar shar
DOS/PC - Pkzipped archive
application/zip zip
Macintosh Binhexed archive
application/mac-binhex40 hqx
Macintosh Stuffit Archive
application/x-stuffit sit sea
Fractal Image Format
application/fractals fif
"Binary UUencoded"
application/octet-stream bin uu
PC executable
application/octet-stream exe
"WAIS ""sources"""
application/x-wais-source src wsrc
NCSA HDF data format
application/hdf hdf

DOWNLOADABLE PROGRAM/SCRIPTS

Javascript program
text/javascript js ls mocha
UNIX bourne shell program
application/x-sh sh
UNIX c-shell program

```
application/x-csh csh
# Perl program
application/x-perl pl
# Tcl (Tool Control Language) program
application/x-tcl tcl

# ANIMATION/MULTIMEDIA

# FutureSplash vector animation (FutureWave)
application/futuresplash spl
# mBED multimedia data (mBED)
application/mbedlet mbd
# PowerMedia multimedia (RadMedia)
application/x-rad-powermedia rad

# PRESENTATION

# PowerPoint presentation (Microsoft)
application/mspowerpoint ppz
# ASAP WordPower (Software Publishing Corp.)
application/x-asap asp
# Astound Web Player multimedia data (GoldDisk)
application/astound asn

# SPECIAL EMBEDDED OBJECT

# OLE script e.g. Visual Basic (Ncompass)
application/x-olescript axs
# OLE Object (Microsoft/NCompass)
application/x-oleobject ods
# OpenScape OLE/OCX objects (Business@Web)
x-form/x-openscape opp
# Visual Basic objects (Amara)
application/x-webbasic wba
# Specialized data entry forms (Alpha Software)
application/x-alpha-form frm
# client-server objects (Wayfarer Communications)
x-script/x-wfxclient wfx

# GENERAL APPLICATIONS

# Undefined binary data (often executable progs)
application/octet-stream exe com
# Pointcast news data (Pointcast)
application/x-pcn pcn
# Excel spreadsheet (Microsoft)
application/vnd.ms-excel xls
# PowerPoint (Microsoft)
```

application/vnd.ms-powerpoint ppt
Microsoft Project (Microsoft)
application/vnd.ms-project mpp
SourceView document (Dataware Electronics)
application/vnd.svd svd
Net Install - software install (20/20 Software)
application/x-net-install ins
Carbon Copy - remote control/access (Microcom)
application/ccv ccv
Spreadsheets (Visual Components)
workbook/formulaone vts

2D/3D DATA/VIRTUAL REALITY TYPES

VRML data file
x-world/x-vrml wrl vrml
WIRL - VRML data (VREAM)
x-world/x-vream vrw
Play3D 3d scene data (Play3D)
application/x-p3d p3d
Viscape Interactive 3d world data (Superscape)
x-world/x-svr svr
WebActive 3d data (Plastic Thought)
x-world/x-wvr wvr
QuickDraw3D scene data (Apple)
x-world/x-3dmf 3dmf

SCIENTIFIC/MATH/CAD TYPES

Mathematica notebook
application/mathematica ma
Computational meshes for numerical simulations
x-model/x-mesh msh
Vis5D 5-dimensional data
application/vis5d v5d
IGES models -- CAD/CAM (CGM) data
application/iges igs
Autocad WHIP vector drawings
drawing/x-dwf dwf

Found in path(s):

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/javamail/mime.types

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* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/MailPreparationException.java
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* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/transaction/AbstractTransactionSupportingCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/commonj/DelegatingWork.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/commonj/DelegatingTimerListener.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/quartz/DelegatingJob.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-

jar/org/springframework/mail/MailParseException.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-

jar/org/springframework/scheduling/quartz/JobMethodInvocationFailedException.java

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* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/commonj/TimerManagerAccessor.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/javamail/MimeMailMessage.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/commonj/ScheduledTimerListener.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/javamail/SmartMimeMessage.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/MailException.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/transaction/TransactionAwareCacheManagerProxy.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/ehcache/EhCacheManagerFactoryBean.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/ui/freemarker/FreeMarkerConfigurationFactoryBean.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/MailMessage.java

* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/quartz/SchedulerAccessorBean.java

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- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/commonj/TimerManagerFactoryBean.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/jcache/interceptor/AbstractFallbackJCacheOperationSource.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/jcache/interceptor/CacheResultOperation.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/jcache/interceptor/JCacheAspectSupport.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/jcache/interceptor/DefaultJCacheOperationSource.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/jcache/interceptor/DefaultCacheKeyInvocationContext.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/quartz/SpringBeanJobFactory.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/quartz/SchedulerFactoryBean.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/javamail/ConfigurableMimeFileTypeMap.java
- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/javamail/MimeMessageHelper.java
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- * /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/jcache/interceptor/AnnotationJCacheOperationSource.java
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* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-

jar/org/springframework/cache/jcache/interceptor/KeyGeneratorAdapter.java

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1.39 hd-parm 9.48

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1.41 chardet 3.0.2

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"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may

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6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

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For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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1.42 libestr 0.1.9

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any

application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

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1.43 jakarta-validation-api 2.0.2

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```

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Validator.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/CascadableDescriptor.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintTarget.java
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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintValidatorContext.java
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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/MessageInterpolator.java
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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/package-info.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/Unwrapping.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/ValueExtractor.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Digits.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraintvalidation/SupportedValidationTarget.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/ValidationProvider.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/GroupConversionDescriptor.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/ExtractedValue.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/bootstrap/GenericBootstrap.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/MethodType.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/ValueExtractorDeclarationException.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/AssertTrue.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Path.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/executable/package-info.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/package-info.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/PositiveOrZero.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/ValueExtractorDefinitionException.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/BootstrapConfiguration.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ElementDescriptor.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ContainerElementTypeDescriptor.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/GroupDefinitionException.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Min.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/Scope.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ReportAsSingleViolation.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ReturnValueDescriptor.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ParameterNameProvider.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Pattern.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/NoProviderFoundException.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Validation.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ValidatorContext.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/NotBlank.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/package-info.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Constraint.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Valid.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintViolationException.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/TraversableResolver.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/executable/ExecutableValidator.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ValidatorFactory.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ContainerDescriptor.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ConstraintDescriptor.java

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* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/NotNull.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/package-info.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/GroupSequence.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Negative.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintValidatorFactory.java

* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ValidationException.java

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- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/BootstrapState.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Email.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintDeclarationException.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/PropertyDescriptor.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintValidator.java
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- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/AssertFalse.java
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- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/DecimalMax.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Positive.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/NotEmpty.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/ConfigurationState.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Payload.java
- * /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/DecimalMin.java
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Files:

include/bsd/err.h

include/bsd/stdlib.h

include/bsd/sys/param.h

include/bsd/unistd.h

src/bsd_getopt.c

src/err.c

src/fgetln.c

src/progname.c

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include/bsd/sys/queue.h
include/bsd/sys/time.h
include/bsd/timeconv.h
include/bsd/vis.h
man/bitstring.3bsd
man/errc.3bsd
man/explicit_bzero.3bsd
man/fgetln.3bsd
man/fgetwln.3bsd
man/fpurge.3bsd
man/funopen.3bsd
man/getbsize.3bsd
man/heapsort.3bsd
man/nlist.3bsd
man/queue.3bsd
man/radixsort.3bsd
man/reallocarray.3bsd
man/reallocf.3bsd
man/setmode.3bsd
man/strmode.3bsd
man/strnstr.3bsd
man/strtoi.3bsd
man/strtou.3bsd
man/unvis.3bsd
man/vis.3bsd
man/wcsncpy.3bsd
src/getbsize.c
src/heapsort.c
src/merge.c
src/nlist.c
src/radixsort.c
src/setmode.c
src/strmode.c
src/strnstr.c
src/strtoi.c
src/strtou.c
src/unvis.c

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include/bsd/stringlist.h

man/fmtcheck.3bsd
man/humanize_number.3bsd
man/stringlist.3bsd
man/timeval.3bsd
src/fmtcheck.c
src/humanize_number.c
src/stringlist.c
src/strtonum.c

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man/closefrom.3bsd
man/expand_number.3bsd
man/flopen.3bsd
man/getpeereid.3bsd
man/pidfile.3bsd
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src/hash/sha512.h
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man/readpassphrase.3bsd
man/strncpy.3bsd
man/strtonum.3bsd
src/arc4random.c
src/arc4random_linux.h
src/arc4random_openbsd.h
src/arc4random_uniform.c
src/arc4random_unix.h
src/arc4random_win.h
src/closefrom.c
src/getentropy_aix.c
src/getentropy_bsd.c
src/getentropy_hpux.c
src/getentropy_hurd.c
src/getentropy_linux.c
src/getentropy_osx.c
src/getentropy_solaris.c
src/getentropy_win.c
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src/hash/md5.c

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1.47 e2fsprogs 1.43.7

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*/

Index: tdbsa/tdb.c

=====
--- tdbsa.orig/tdb.c

+++ tdbsa/tdb.c

@@ -4,11 +4,11 @@ Rev: 23371

Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)

*/

/*

- Unix SMB/CIFS implementation.
- + trivial database library - standalone version

- trivial database library - private includes

-

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#

This is a Makefile stub which handles the creation of BSD shared
libraries.

#

In order to use this stub, the following makefile variables must be defined.

#

BSDLIB_VERSION = 1.0

BSDLIB_IMAGE = libce

```

# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
@echo " MKDIR pic"
@mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image: $(BSD_LIB)

$(BSD_LIB): $(OBJS)
(cd pic; ld -Bshareable -o $(BSD_LIB) $(LD_FLAGS_SHLIB) $(OBJS))
$(MV) pic/$(BSD_LIB) .
$(RM) -f ../$(BSD_LIB)
(cd ..; $(LN) $(LINK_BUILD_FLAGS) \
`echo $(my_dir) | sed -e 's;lib/;;' /$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
@echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
@$(INSTALL_PROGRAM) $(BSD_LIB) \
$(DESTDIR)$$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
@-$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
$(RM) -f $(DESTDIR)$$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
$(RM) -rf pic
$(RM) -f $(BSD_LIB)
$(RM) -f ../$(BSD_LIB)

```

This is the Debian GNU/Linux prepackaged version of the Common Error Description library. It is currently distributed together with the EXT2 file system utilities, which are otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>, from sources obtained from a mirror of:
tsx-11.mit.edu/pub/linux/packages/ext2fs/

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Theodore Ts'o
23-June-2007

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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/annotation/AspectJAdvisorFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/AspectJAfterAdvice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/AspectJAfterThrowingAdvice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/DefaultAopProxyFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/SingletonAspectInstanceFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/TargetClassAware.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/AdvisorChainFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/adapter/AfterReturningAdviceInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/ProxyProcessorSupport.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/support/StaticMethodMatcher.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/target/AbstractPoolingTargetSource.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/adapter/ThrowsAdviceInterceptor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/AspectJProxyFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/TargetSource.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJExpressionPointcut.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/AutoProxyUtils.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/MethodInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AdvisorComponentDefinition.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/scope/ScopedProxyFactoryBean.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/dynamic/AbstractRefreshableTargetSource.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/aop/AspectException.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/SimpleAspectInstanceFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/DefaultAdvisorChainFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/MethodInvocationProceedingJoinPoint.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/BeanFactoryAspectJAdvisorsBuilder.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/TruePointcut.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/ConstructorInvocation.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/ProxyConfig.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/IntroductionInfoSupport.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/MethodBeforeAdvice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/AbstractPrototypeBasedTargetSource.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/DeclareParentsAdvisor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/AsyncExecutionAspectSupport.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/GlobalAdvisorAdapterRegistry.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/RegexMethodPointcutAdvisor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/CommonsPool2TargetSource.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/Advised.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/RuntimeTestWalker.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/ConfigBeanDefinitionParser.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/DefaultAdvisorAutoProxyCreator.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/AbstractAspectJAdvisorFactory.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/TrueMethodMatcher.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/BeanFactoryAspectInstanceFactory.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/AsyncExecutionInterceptor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJAdviceParameterNameDiscoverer.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/ProxyCreationContext.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/ExposeBeanNameAdvisors.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/InstantiationModelAwarePointcutAdvisorImpl.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJPointcutAdvisor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/NotAnAtAspectException.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/SimpleAsyncUncaughtExceptionHandler.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/BeanFactoryAdvisorRetrievalHelper.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/target/AbstractBeanFactoryBasedTargetSourceCreator.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/EmptyTargetSource.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/AbstractBeanFactoryBasedTargetSource.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/target/QuickTargetSourceCreator.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/DefaultAdvisorAdapterRegistry.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/DynamicMethodMatcher.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/AdvisorAdapterRegistry.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJPrecedenceInformation.java

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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AbstractAdvisingBeanPostProcessor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/HotSwappableTargetSource.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/AbstractLazyCreationTargetSource.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/TrueClassFilter.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/AbstractBeanFactoryAwareAdvisingPostProcessor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/annotation/AnnotationClassFilter.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/IntroductionAwareMethodMatcher.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/AbstractRegexpMethodPointcut.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AopNamespaceUtils.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/StaticMethodMatcherPointcutAdvisor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/ProxyCreatorSupport.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AbstractSingletonProxyFactoryBean.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/SingletonTargetSource.java

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jar/org/springframework/aop/ThrowsAdvice.java

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jar/org/springframework/aop/support/NameMatchMethodPointcutAdvisor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/autoprox/target/LazyInitTargetSourceCreator.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/target/PrototypeTargetSource.java
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jar/org/springframework/aop/framework/ProxyFactoryBean.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
```

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jar/org/springframework/aop/framework/CglibAopProxy.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/autoproxy/AspectJAwareAdvisorAutoProxyCreator.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/AopContext.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/interceptor/AbstractMonitoringInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/interceptor/CustomizableTraceInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/annotation/ReflectiveAspectJAdvisorFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/adapter/MethodBeforeAdviceInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/autoproxy/AspectJPrecedenceComparator.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/autoproxy/AbstractAdvisorAutoProxyCreator.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/interceptor/ExposeInvocationInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/config/AopNamespaceHandler.java
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jar/org/springframework/aop/BeforeAdvice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/config/AspectEntry.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/InterceptorAndDynamicMethodMatcher.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/AdvisedSupportListener.java
```

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/AfterAdvice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/IntroductionInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AopInfrastructureBean.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/SpringProxy.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/RawTargetAccess.java

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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/SingletonMetadataAwareAspectInstanceFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/aop/Advice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/Joinpoint.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/ProxyFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJAfterReturningAdvice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AspectJAutoProxyBeanDefinitionParser.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/ConstructorInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-

jar/org/springframework/aop/aspectj/annotation/SimpleMetadataAwareAspectInstanceFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/aopalliance/intercept/MethodInvocation.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/autoproxy/TargetSourceCreator.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/aopalliance/intercept/Invocation.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/config/SimpleBeanFactoryAwareAspectInstanceFactory.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/interceptor/PerformanceMonitorInterceptor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/DelegatingIntroductionInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJAroundAdvice.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/SimpleTraceInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/DelegatePerTargetObjectIntroductionInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJExpressionPointcutAdvisor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectInstanceFactory.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/JamonPerformanceMonitorInterceptor.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/MethodLocatingFactoryBean.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/BeanNameAutoProxyCreator.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/AbstractExpressionPointcut.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/ExpressionPointcut.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/InfrastructureAdvisorAutoProxyCreator.java
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jar/org/springframework/aop/MethodMatcher.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
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jar/org/springframework/aop/framework/JdkDynamicAopProxy.java
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jar/org/springframework/aop/support/annotation/AnnotationMethodMatcher.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/aspectj/AspectJProxyUtils.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-

jar/org/springframework/aop/aspectj/TypePatternClassFilter.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/ClassFilter.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJAopUtils.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/DynamicIntroductionAdvice.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/SpringConfiguredBeanDefinitionParser.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/scope/DefaultScopedObject.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/ThreadLocalTargetSourceStats.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AdvisorEntry.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AdviceEntry.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/LazyInitTargetSource.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/AdvisorAdapterRegistrationManager.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/ScopedProxyBeanDefinitionDecorator.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/IntroductionInfo.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/AopInvocationException.java
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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/scope/ScopedObject.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/DebugInterceptor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/DynamicMethodMatcherPointcut.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/Pointcut.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/AfterReturningAdviceAdapter.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/ConcurrencyThrottleInterceptor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/UnknownAdviceTypeException.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/dynamic/BeanFactoryRefreshableTargetSource.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/PointcutComponentDefinition.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/IntroductionAdvisor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/ThrowsAdviceAdapter.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/SimpleBeanTargetSource.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/JdkRegexpMethodPointcut.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/StaticMethodMatcherPointcut.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AopConfigException.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/dynamic/Refreshable.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/PointcutAdvisor.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/AfterReturningAdvice.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/PoolingConfig.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/PointcutEntry.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/AdvisorAdapter.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AopProxy.java

* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AopProxyFactory.java

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- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/ElementHandler.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/CDATA.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/Document.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/rule/Action.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/Comment.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/Entity.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/bean/BeanDocumentFactory.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/FlyweightCDATA.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/IllegalAddException.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/jaxb/JAXBModifier.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/FilterIterator.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMDocumentType.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/rule/Pattern.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/rule/Rule.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/NamespaceStack.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/NamespaceCache.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/jaxb/JAXBObjectHandler.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/DOMReader.java
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* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
jar/org/dom4j/io/DispatchHandler.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
jar/org/dom4j/io/SAXModifyContentHandler.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
jar/org/dom4j/tree/AbstractComment.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
jar/org/dom4j/util/AttributeHelper.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
jar/org/dom4j/tree/DefaultText.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
jar/org/dom4j/tree/DefaultNamespace.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/Element.java

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- */

Found in path(s):

- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/DocumentHelper.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/SAXReader.java
- * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/SAXHelper.java

1.52 open-ldap 2.4.49+dfsg-2ubuntu1.8

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That's all there is to it!

1.54 go-runtime 1.15.1

1.54.1 Available under license :

```
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Names should be added to this file like so:
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Individual's name <submission email address> <email2> <emailN>

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first address should be used in the submit logs and
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Aamir Khan <syst3m.w0rm@gmail.com>
Aaron Beitch <aaronb@arista.com>
Aaron Bieber <deftly@gmail.com>
Aaron Cannon <cannona@fireantproductions.com>
Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
Aaron Kemp <kemp.aaron@gmail.com>
Aaron Patterson <tenderlove@ruby-lang.org>
Aaron Stein <aaronstein12@gmail.com>
Aaron Torres <tcboox@gmail.com>
Aaron Zinman <aaron@azinman.com>
Aarti Parikh <aarti.parikh@gmail.com>
Abdullah Al Maruf <mymail.maruf@gmail.com>
Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Azarchs <adam.azarchs@10xgenomics.com>
Adam Bender <abender@google.com>
Adam Eijdenberg <adam@continusec.com>
Adam Harvey <aharvey@php.net>
Adam Kisala <adam.kisala@gmail.com>
Adam Langley <agl@golang.org>
Adam Medzinski <adam.medzinski@gmail.com>
Adam Shannon <adamkshannon@gmail.com>
Adam Shelton <aashelt90@gmail.com>
Adam Sindelar <adamsh@google.com>
Adam Thomason <athomason@gmail.com>
Adam Williams <pwnfactory@gmail.com>
Adam Woodbeck <adam@woodbeck.net>
Adarsh Ravichandran <adarshravichandran91@gmail.com>
Aditya Harindar <aditya.harindar@gmail.com>
Aditya Mukerjee <dev@chimeracoder.net>
Adrian Hesketh <adrianhesketh@hushmail.com>
Adrian Nos <nos.adrian@gmail.com>
Adrian O'Grady <elpollouk@gmail.com>

Adrien Bustany <adrien-xx-google@bustany.org>
Adrien Delorme <adrien.delorme@icloud.com>
Adrien Petel <peteladrien@gmail.com>
Acio Jnior <aeciodantasjunior@gmail.com>
Aeneas Rekkas (arekkas) <aeneas@ory.am>
Afanasev Stanislav <phpprogger@gmail.com>
Agis Anastasopoulos <agis.anast@gmail.com>
Agniva De Sarker <agnivade@yahoo.co.in>
Ahmed Wahed <oneofone@gmail.com>
Ahmet Alp Balkan <ahmetb@google.com>
Ahmet Soormally <ahmet@mangomm.co.uk>
Ahmy Yulrizka <yulrizka@gmail.com>
Ahsun Ahmed <ahmed.ahsun@gmail.com>
Aiden Scandella <ai@uber.com>
Ainar Garipov <gugl.zadolbal@gmail.com>
Aishraj Dahal <aishraj@users.noreply.github.com>
Akhil Indurti <aindurti@gmail.com>
Akihiro Suda <suda.kyoto@gmail.com>
Akshat Kumar <seed@mail.nanosouffle.net>
Al Cutter <al@google.com>
Alan Braithwaite <alan@ipaddr.org>
Alan Donovan <adonovan@google.com>
Alan Shreve <alan@inconshreveable.com>
Albert Nigmatzianov <albertnigma@gmail.com>
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Albert Yu <yukinying@gmail.com>
Alberto Bertogli <albertito@blitiri.com.ar>
Alberto Donizetti <alb.donizetti@gmail.com>
Alberto Garca Hierro <alberto@garciahierro.com> <alberto.garcia.hierro@gmail.com>
Alec Benzer <alec.benzer@gmail.com>
Aleksa Sarai <cyphar@cyphar.com>
Aleksandar Dezelin <dezelin@gmail.com>
Aleksandr Lukinykh <a.lukinykh@xsolla.com>
Aleksandr Razumov <ar@cydev.ru>
Alekseev Artem <a.artem060@gmail.com>
Alessandro Arzilli <alessandro.arzilli@gmail.com>
Alessandro Baffa <alessandro.baffa@gmail.com>
Alex A Skinner <alex@lx.lc>
Alex Brainman <alex.brainman@gmail.com>
Alex Bramley <abramley@google.com>
Alex Browne <stephenalexbrowne@gmail.com>
Alex Buchanan <buchanae@gmail.com>
Alex Carol <alex.carol.c@gmail.com>
Alex Gaynor <alex@alloy.us>
Alex Harford <alex.harford@saucelabs.com>
Alex Jin <toalexjin@gmail.com>
Alex Kohler <alexjohnkohler@gmail.com>

Alex Myasoedov <msoedov@gmail.com>
Alex Plugaru <alex@plugaru.org> <alexandru.plugaru@gmail.com>
Alex Schroeder <alex@gnu.org>
Alex SergeyeV <abc@alexsergeyev.com>
Alex Tokarev <aleksator@gmail.com>
Alex Vaghin <crhyme@google.com>
Alex Zhirov <azhirov@google.com>
Alexander Demakin <alexander.demakin@gmail.com>
Alexander Dring <email@alex.d.ch>
Alexander F Rdseth <alexander.rodseth@appeartv.com>
Alexander Greim <alexxx@iltempo.de>
Alexander Guz <kalimatas@gmail.com>
Alexander Kauer <alexander@affine.space>
Alexander Kucherenko <alxkchr@gmail.com>
Alexander Larsson <alexander.larsson@gmail.com>
Alexander Lourier <aml@rulezz.ru>
Alexander Menzhinsky <amenzhinsky@gmail.com>
Alexander Morozov <lk4d4math@gmail.com>
Alexander Neumann <alexander@bumper.de>
Alexander Nohe <alex.nohe427@gmail.com>
Alexander Orlov <alexander.orlov@loxal.net>
Alexander Pantyukhin <apantykhin@gmail.com>
Alexander Polcyn <apolcyn@google.com>
Alexander Rakoczy <alex@golang.org>
Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zillion <alex@alexzillion.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandr Mayorskiy <a.mayorskiy@corp.mail.ru>
Alexandre Cesaro <alexandre.cesaro@gmail.com>
Alexandre Fiori <fiorix@gmail.com>
Alexandre Maari <draeron@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandre Parentea <aubonbeurre@gmail.com>
Alexandre Viau <alexandre@alexandreviau.net>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Alexandrov <aalexand@google.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Naidonov <alexey.naidyonov@gmail.com>
Alexey Neganov <neganovalexey@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexey Semenyuk <alexsemenyuk88@gmail.com>
Alexis Hildebrandt <surryhill@gmail.com>
Alexis Hunt <lexer@google.com>
Alexis Imperial-Legrand <ail@google.com>
Ali Farooq <ali.farooq0@pm.me>

Ali Rizvi-Santiago <arizvisa@gmail.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>
Allen Li <ayatane@google.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Aman Gupta <aman@tmm1.net>
Amarjeet Anand <amarjeetanandsingh@gmail.com>
Amir Mohammad Saied <amir@gluegadget.com>
Amr Mohammed <merodiro@gmail.com>
Amrut Joshi <amrut.joshi@gmail.com>
An Long <aisk1988@gmail.com>
An Xiao <hac@zju.edu.cn>
Anand K. Mistry <anand@mistry.ninja>
Anders Pearson <anders@columbia.edu>
Anderson Queiroz <contato@andersonq.eti.br>
Andr Carvalho <asantostc@gmail.com>
Andr Martins <aanm90@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Nodari <andrea.nodari91@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Enshin <b1os@bk.ru>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew G. Morgan <agm@google.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Louis <alouis@digitalocean.com>
Andrew Lutomirski <andy@luto.us>
Andrew Medvedev <andrew.y.medvedev@gmail.com>

Andrew Pilloud <andrewpilloud@igneoussystems.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stormont <astormont@racktopsystems.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
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Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
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Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Pan <panjf2000@gmail.com>
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Andy Wang <cbeuw.andy@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
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Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>
Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Annirudh Prasad <annirudh@wandb.com>
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Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <alidity@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>
Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>

Anton Gyllenberg <anton@iki.fi>
Anton Kuklin <anton.a.kuklin@gmail.com>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>
Antonio Bibiano <antbbn@gmail.com>
Antonio Huete Jimenez <tuxillo@quantumachine.net>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Anze Kolar <me@akolar.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>
Araragi Hokuto <kanseihonbucho@protonmail.com>
Arash Bina <arash@arash.io>
Arda Gl <ardaguclu@gmail.com>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Alekseev <artem.alekseev@intel.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmanni <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Aurlio A. Heckert <aurium@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>
awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayan George <ayan@ayan.net>
Ayanamist Yang <ayanamist@gmail.com>
Ayke van Laethem <aykevanlaethem@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>

Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>
Baokun Lee <nototon@gmail.com>
Barnaby Keene <accounts@southcla.ws>
Bartosz Grzybowski <melkorm@gmail.com>
Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>
Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Ben Toews <mastahyeti@gmail.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benjamin Wuethrich <benjamin.wuethrich@gmail.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbharath91@gmail.com>
Bhavin Gandhi <bhavin7392@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>
Bill Zissimopoulos <billziss@navimatics.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Billy Zaelani Malik <m.billyzaelani@gmail.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>

Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob McNaughton <bobmcn@gmail.com>
Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boqin Qin <bobbqqin@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>
Brad Erickson <bderickson@gmail.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradford Lamson-Scribner <brad.lamson@gmail.com>
Bradley Falzon <brad@teambread.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Philips <brandon@ifup.org>
Brandon Ryan <bjryan19@gmail.com>
Brayden Cloud <bcloud@google.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian Falk <falk@logicparty.org>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkenney@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Bryan Heden <b.heden@gmail.com>
Bulat Gaifullin <gaifullinbf@gmail.com>

Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlisia Campos <carlisia@grokkingtech.io>
Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Amedee <carlos@golang.org>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlosedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Iriarte <ciriarte@gmail.com>
Carlos Souza <carloshrsouza@gmail.com>
Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Changkun Ou <hi@changkun.us>
Channing Kimble-Brown <channing@golang.org>
Chao Xu <xuchao@google.com>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Chauncy Cullitan <chauncyc@google.com>
Chen Zhihan <energiehund@gmail.com>
Cherry Zhang <cherryyz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>

Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>
Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Le Roy <brompwnie@users.noreply.github.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>
Chris Manghane <cmang@golang.org>
Chris Marchesi <chrism@vanclueverttech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Loessl <cloessl+github@gmail.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clement Chigot <clement.chigot@atos.net>
Clement Skau <clementskau@gmail.com>
Clint J. Edwards <clint.j.edwards@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>

Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>
Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Conrado Gouvea <conradopl@gmail.com>
Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Corne van der Plas <vdplas@gmail.com>
Cosmos Nicolaou <cnicolaou@google.com>
Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrill@schumacher.fm>
Daisuke Fujita <dtanshi45@gmail.com>
Daisuke Suzuki <daisuzu@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damien.lespiau@gmail.com> <damien.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damien@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Scales <danscales@google.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Kumor <rdkumor@gmail.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mangum <georgedanielmangum@gmail.com>
Daniel Mart <mvdan@mvdan.cc>

Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruzalek@gmail.com>
Danish Dua <danishdua@google.com>
Danish Prakash <grafitykoncept@gmail.com>
Danny Rosseau <daniel.rosseau@gmail.com>
Daria Kolistratova <daria.kolistratova@intel.com>
Darien Raymond <admin@v2ray.com>
Darren Elwood <darren@textnode.com>
Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Bond <davidsbond93@gmail.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Carter <fresco.raja@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Golden <david@autopragmatic.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>

David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>
David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>
David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>
David Wimmer <davidlwimmer@gmail.com>
Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Eigenmann <7621705+decanus@users.noreply.github.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Isaev <idenx@yandex.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>
Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvdutt Jadhav <dhruvdutt.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>

Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Doga Fincan <doga@icloud.com>
Domas Tamauskas <puerdomus@gmail.com>
Domen Ipavec <domen@ipavec.net>
Dominic Green <dominicgreen1@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>
Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duco van Amstel <duco.vanamstel@gmail.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>
Ed Schouten <ed@nuxi.nl>
Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>

Eduardo Villaseor <evillasrmx@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliek <efliek@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>
Ellison Leao <ellisonleao@gmail.com>
Emerson Lin <linyintor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Emreacan Bati <emreacanbati@gmail.com>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Biggers <ebiggers@google.com>
Eric Brown <browne@vmware.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rutherford <erutherford@gmail.com>
Eric Rykwalder <e.rykwalder@gmail.com>
Erick Tryzelaar <etryzelaar@google.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>

Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Eugene Formanenko <mo4islona@gmail.com>
Eugene Kalinin <e.v.kalinin@gmail.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Kulikov <tuxuls@gmail.com>
Evgeniy Polyakov <zbr@ioremapi.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youreemail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Fedor Korotkiy <dartslon@gmail.com>
Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Cornelius <9767036+fcornelius@users.noreply.github.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Ferenc Szabo <frncmx@gmail.com>
Filip Gruszczyski <gruszczyski@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>

Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>
Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>
Francisco Souza <franciscossouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Frederik Ring <frederik.ring@gmail.com>
Frederik Zipp <fzipp@gmx.de>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fujimoto Kyosuke <kyoro.f@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Rosenhouse <rosenhouse@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@gaurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Gauthier Jolly <gauthier.jolly@gmail.com>
Gawen Arab <gawen.arab@c.zen.ly>
Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>
George Hartzell <hartzell@alerce.com>

George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>
Gernot Vormayr <gvormayr@gmail.com>
Gert Cuykens <gert.cuykens@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Ghazni Nattarshah <ghazni.nattarshah@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>
GitHub User @aca (50316549) <acadx0@gmail.com>
GitHub User @ajnrp (1688456) <ajnrp@users.noreply.github.com>
GitHub User @ajz01 (4744634) <ajzdenek@gmail.com>
GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andig (184815) <cpuidle@gmx.de>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chainhelen (7046329) <chainhelen@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @cncal (23520240) <flycalvin@qq.com>
GitHub User @DQNEO (188741) <dqneo@gmail.com>
GitHub User @Dreamacro (8615343) <chuainian@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @fatedier (7346661) <fatedier@gmail.com>
GitHub User @frenkie (6499251) <mail@rhab.de>
GitHub User @geedchin (11672310) <geedchin@gmail.com>
GitHub User @GrigoriyMikhalkin (3637857) <grigoriymikhalkin@gmail.com>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @jinmiaoluo (39730824) <jinmiaoluo@icloud.com>
GitHub User @jobbrown (6345470) <msshane2008@gmail.com>
GitHub User @kazysshr (30496953) <kazysshr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @ly303550688 (11519839) <yang.liu636@gmail.com>
GitHub User @madiganz (18340029) <zacharywmadigan@gmail.com>
GitHub User @maltalex (10195391) <code@bit48.net>
GitHub User @Matt966 (28551465) <Matt966@users.noreply.github.com>

GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @nu50218 (40682920) <nu_ll@icloud.com>
GitHub User @OlgaVIPetrova (44112727) <OVPPetrova@gmail.com>
GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @po3rin (29445112) <abctail30@gmail.com>
GitHub User @pokutuna (57545) <popopopokutuna@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @ramenjuniti (32011829) <ramenjuniti@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Choroma194@gmail.com>
GitHub User @skanehira (7888591) <sho19921005@gmail.com>
GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>
GitHub User @tell-k (26263) <ffk2005@gmail.com>
GitHub User @tennashi (10219626) <tennashio@gmail.com>
GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <utkarsh.extc@gmail.com>
GitHub User @witchard (4994659) <witchard@hotmail.co.uk>
GitHub User @yah01 (12216890) <kagaminehuan@gmail.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @zikaeroh (48577114) <zikaeroh@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gnezdo+github@google.com>
Greg Thelen <gthelen@google.com>
Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Gregory Petrosyan <gregory.petrosyan@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmes.net>
Gnther Noack <gnoack@google.com>
Guobiao Mei <meiguobiao@gmail.com>

Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>
Han-Wen Nienhuys <hanwen@google.com>
Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hasit Bhatt <hasit.p.bhatt@gmail.com>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdtt@gmail.com>
Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hiromichi Ema <ema.hiro@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>

Hongfei Tan <feilengcui008@gmail.com>
Horacio Duran <horacio.duran@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Howard Zhang <howard.zhang@arm.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Huan Du <i@huandu.me>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Hyoyoung Chang <hyoyoung@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>
Ignacio Hagopian <jsign.uy@gmail.com>
Igor Bernstein <igorbernstein@google.com>
Igor Dolzhevikov <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Illya Yalovyy <yalovoy@gmail.com>
Ilya Sinelnikov <sidhmangh@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irbe Krumina <irbekrm@gmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Isfan Azhabil <isfanazhabil@gmail.com>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>

Ivan Bertona <ivan.bertona@gmail.com>
Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>
Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchii <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Trubach <mr.trubach@icloud.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jaap Aarts <jaap.aarts1@gmail.com>
Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Kaczmarzyk <jakubk@mit.edu>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
Jamal Carvalho <jamal.a.carvalho@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>
James David Chalfant <james.chalfant@gmail.com>
James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jljatone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>
James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>

James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jamieliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>
Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnml@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Allard <jaredallard@users.noreply.github.com>
Jared Culp <jculp14@gmail.com>
Jaroslavas Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Baker <jason-baker@users.noreply.github.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>
Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weisskopf <jay@jayschwa.net>
Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>

Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jdrzej Szczepaniak <jbszczepaniak@gmail.com>
Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>
Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Faller <jeremy@golang.org>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jia Zhan <jzhan@uber.com>
Jiacai Liu <jiacai2050@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jie Ma <jienius@outlook.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>
Jimmy Frasche <soapboxcicero@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londevil@gmail.com>

Jirka Dank <dnk@mail.muni.cz>
Jiulong Wang <jiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>
Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>
Joe Shaw <joe@joeshaw.org>
Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Jansson <johan.jansson@iki.fi>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John McCabe <john@johnmccabe.net>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Papandriopoulos <jpap.code@gmail.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
John Weldon <johnweldon4@gmail.com>
Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jon Johnson <jonjohnson@google.com>
Jonas Bernoulli <jonas@bernoul.li>

Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>
Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kiefte <ikojba@gmail.com> <joop@kiefte.net>
Jordan Christiansen <xordspar0@gmail.com>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jorge L. Fatta <jorge.fatta@auth0.com>
Jos Visser <josv@google.com>
Josa Gesell <josa@gesell.me>
Jose Luis Vazquez Gonzalez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Baum <joshbaum@google.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Bezaleel Abednego <joshua.bezaleel@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Joshua Crowgey <jcrowgey@uw.edu>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhaug <js@solidsystem.no>

JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
JT Olio <hello@jtolio.com>
Juan Carlos <juanjcsr@gmail.com>
Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>
Julian Tibble <julian.tibble@gmail.com>
Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Jun Zhang <jim.zoumo@gmail.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>
Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmiller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kalman Bekesi <kalmanb@google.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Kanta Ebihara <kantaebihara@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katharine Berry <ktbry@google.com>
Katie Hockman <katie@golang.org>

Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keisuke Kishimoto <keisuke.kishimoto@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelly Heller <pestophagous@gmail.com>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Kerollos Magdy <kerolloz@yahoo.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevan Swanberg <kevswanberg@gmail.com>
Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kvin Dunglas <dunglas@gmail.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Keyan Pishdadian <kpishdadian@gmail.com>
Kezhu Wang <kezhuw@gmail.com>
Khosrow Moossavi <khos2ow@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Korotaev <kirillx@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>

Kirill Smelkov <kirr@nexedi.com>
Kirill Tatchihin <kirabsuir@gmail.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Koki Tomoshige <tomocy.dev@gmail.com>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Koya IWAMURA <kiwamura0314@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitijgaraogi@gmail.com>
Kun Li <likunarmstrong@gmail.com>
Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kush Patel <kush.patel@hootsuite.com>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Nusbaum <kyle@datadog.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>
Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Kirylo Silin <silin@kirylo.org>
L Campbell <unpantsu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lanm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>
Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>

Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>
Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Liam Haworth <liam@haworth.id.au>
Lily Chung <lilithkchung@gmail.com>
Lion Yang <lion@aosc.xyz>
Liz Rice <liz@lizrice.com>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Brun <lorenz@brun.one>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>
Luca Greco <luca.greco@alcacoop.it>
Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luke Young <bored-engineer@users.noreply.github.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>
Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>

Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>
Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Sanmiquel <marcsanmiquel@gmail.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Weiner <marcus.weiner@gmail.com>
Marcus Willock <crazycalm@gmail.com>
Marga Manterola <marga@google.com>
Mariano Cano <mariano@smallstep.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>
Marius Nuennerich <mnu@google.com>
Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Kungla <marko.kungla@gmail.com>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>

Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>
Martin Asquino <martin.asquino@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>
Martin Kunc <martinkunc@users.noreply.github.com>
Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Masaya Watanabe <sfbgwm30@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>
Mt Gulys <mgulyas86@gmail.com>
Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mdbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>

Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>
Matt Layher <mdllyher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdin.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Pugachev <pugachev.mm@gmail.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>
Maya Rashish <maya@NetBSD.org>
Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com> <mzh@golangcn.org>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszek <mknyszek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>
Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorner.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>

Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>
Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufel <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgraber <mteichgraber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <zitek@inet.pl>
Michal Franc <lam.michal.franc@gmail.com>
Michałowicki <młowicki@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Acero <acero@google.com>
Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>

Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mike Tsao <mike@sowbug.com>
Mike Wiacek <mjwiacek@google.com>
Mikhail Fesenko <proggga@gmail.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milan Patel <bicelot3@gmail.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Mohit Verma <vmohit.93@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moritz Fain <moritz@fain.io>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mostyn Bramley-Moore <mostyn@antipode.se>
Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mukesh Sharma <sharma.mukesh439@gmail.com>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Naman Aggarwal <aggarwal.nam@gmail.com>
Nan Deng <monnand@gmail.com>

Nao Yonashiro <owan.orisano@gmail.com>
Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>
Nathan Caza <mastercactus@gmail.com>
Nathan Dias <nathan.dias@orijtech.com>
Nathan Fiscaletti <nathan.fiscaletti@vrazo.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otterness@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neeilan Selvalingam <neeilan96@gmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>

Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Gillmann <nikita@n0.is> <ng0@n0.is>
Nikita Kryuchkov <nkryuchkov10@gmail.com>
Nikita Vanyasin <nikita.vanyasin@gmail.com>
Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nikson Kanti Paul <nikson.sust@gmail.com>
Nils Larsgrd <nilsmagnus@gmail.com>
Nir Soffer <nirsof@gmail.com>
Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noah Goldman <noahg34@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>
Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Nuno Cruces <ncruces@users.noreply.github.com>
Obeyda Djefal <djefobey@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Powell <oliverpowell84@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogosoftware.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryanmoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Caderno <kaderno@gmail.com>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorpus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Panos Georgiadis <pgeorgiadis@suse.de>
Pantelis Sampaziotis <psampaz@gmail.com>

Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>
Pascal Dierich <pascal@pascaldierich.com>
Pascal S. de Kloe <pascal@quies.net>
Paschalis Tsilias <paschalis.tsilias@gmail.com>
Pasi Thkp <pasi.tahkapaa@gmail.com>
Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul D. Weber <x0bdev@gmail.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Paulo Gomes <paulo.gomes.uk@gmail.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>

Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Pei Xian Chee <luciolas1991@gmail.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>
Petar Dambovaliev <petar.atanasov.1987@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>
Peter Dotchev <dotchev@gmail.com>
Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>
Peter Nguyen <peter@mictis.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>
Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.brgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Carru <pierre.carru@eshard.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@hellopiers.pro>
Pieter Droogendijk <pieter@binky.org.uk>

Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Polina Osadcha <polliosa@google.com>
Pontus Leitzler <leitzler@gmail.com>
Povilas Versockas <p.versockas@gmail.com>
Prasanga Siripala <pj@pjeps.com.au>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Agrawal <prashant.a.vjti@gmail.com>
Prashant Varanasi <prashant@prashantv.com>
Praveen Kumar <praveen+git@kumar.in>
Pravendra Singh <hackpravj@gmail.com>
Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quey-Liang Kao <s101062801@m101.nthu.edu.tw>
Quinn Slack <sq@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>

Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Ren Ogaki <re.yuz77777@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>
Ricardo Padilha <ricardospadilha@gmail.com>
Ricardo Seriani <ricardo.seriani@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Richard Ulmer <codesoap@mailbox.org>
Richard Wilkes <wilkes@me.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saareln <rsaareln@gmail.com>
Rob Earhart <earhart@google.com>
Rob Findley <rfindley@google.com>
Rob Norman <rob.norman@infinitycloud.com>
Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Kuska <rkuska@gmail.com>
Robert Obryk <robryk@gmail.com>
Robert Seseek <rseseek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Robin Zhong <robin@robinzhong.co>
Rodolfo Carvalho <rhcavalho@gmail.com>
Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>

Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Challa <rohan@golang.org>
Rohan Verma <rohanverma2004@gmail.com>
Rohith Ravi <entombedvirus@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bague <romain.bague@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Kollr <roman.kollar.0@gmail.com>
Roman Shchekin <mrqtros@gmail.com>
Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Kinsey <rossikinsey@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <ruiiu@google.com>
Ruixin Bao <ruixin.bao@ibm.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribldb@google.com>
Ryan Canty <jrcanty@gmail.com>
Ryan Dahl <ry@tinyclouds.org>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>
Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Sakeven Jiang <jc5930@sina.cn>
Salmn Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>

Sam Boyer <tech@samboyer.org>
Sam Chen <chenxsan@gmail.com>
Sam Cross <samgcdev@gmail.com>
Sam Ding <samding@ca.ibm.com>
Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>
Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediaruna.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sardorbek Pulatov <sardorbek.pulatov@outlook.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Ragan <ragansa@fb.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Liao <seankhliao@gmail.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Chlopecki <sebsebmc@gmail.com>
Sebastian Kinne <skinne@google.com>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>
Seiji Takahashi <timaki.st@gmail.com>
Sergei Lemeshkin <sergeilem@gmail.com>

Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'Snake' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Glushchenko <gs serge@gmail.com>
Sergey Ivanov <ser1325@gmail.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>
Sergey Semin <gray12511@gmail.com>
Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhat Giydiren <serhatgydiren@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shang Jian Ding <sding3@ncsu.edu>
Shaozhen Ding <dsz0111@gmail.com>
Shaquille Wyan Que <shaqywyuan@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <selliot@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zs j950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shivashis Padhi <shivashispadhi@gmail.com>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simarpreet Singh <simar@linux.com>
Simon Drake <simondrake1990@gmail.com>
Simon Ferquel <simon.ferquel@docker.com>
Simon Jefford <simon.jefford@gmail.com>

Simon Rawet <simon@rawet.se>
Simon Rozman <simon@rozman.si>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sjoerd Siebinga <sjoerd.siebinga@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Soojin Nam <jsunam@gmail.com>
Sren L. Hansen <soren@linux2go.dk>
Spencer Kocot <spencerkocot@gmail.com>
Spencer Nelson <s@spenczar.com>
Spencer Tung <spencertung@google.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
Srinidhi Kaushik <shrinidhi.kaushik@gmail.com>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Renatus <srenatus@chef.io>
Stephan Zuercher <zuercher@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimisteve@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littiebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>

Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>
Sunny <me@darkowlzz.space>
Suriyaa Sundararuban <suriyaasundararuban@gmail.com>
Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sven Taute <sven.taute@gmail.com>
Sylvain Zimmer <sylvain@sylvainzimmer.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>
Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Tadeo Kondrak <me@tadeo.ca>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tams Gulcsi <tgulacsi78@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Qingyun <qingyunha@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddotx.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>

The Hatsune Daishi <nao20010128@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>
Thomas Kappler <tkappler@gmail.com>
Thomas Meson <zllak@hycik.org>
Thomas Symborski <thomas.symborski@gmail.com>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianji Wu <the729@gmail.com>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>
Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Mhlmann <muhlemmer@gmail.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubeei@gmail.com>
Timmy Douglas <timmyd983@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>
Timothy Studd <tim@timstudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>

Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Parkin <tom.parkin@gmail.com>
Tom Payne <twpayne@gmail.com>
Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tomas Dabasinskas <tomas@dabasinskas.net>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomohiro Kusumoto <zabio1192@gmail.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>
Tonis Tiigi <tonistiigi@gmail.com>
Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Torben Schinke <torben.schinke@neotos.de>
Tormod Erevik Lea <tormodlea@gmail.com>
Toshihiro Shiino <shiino.toshihiro@gmail.com>
Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Oohry <oohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tsuji Daishiro <dram.dt.shonan@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tyson Andre <tysonandre775@gmail.com>
Tzach Shabtay <tzachshabtay@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangjparmar@gmail.com>

Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vee Zhang <veezhang@126.com> <vveezhang@gmail.com>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>
Viacheslav Poturaev <vearutop@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Ville Skytt <ville.skytta@iki.fi>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>
Visweswara R <r.visweswara@gmail.com>
Vitaly Zdanevich <zdanevich.vitaly@ya.ru>
Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vivian Liang <vliang88@gmail.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Evgrafov <evgrafov.vladimir@gmail.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Vladimir Varankin <nek.narqo@gmail.com>
Vojtech Bocek <vbocek@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgriffel@gmail.com>
Walt Della <walt@javins.net>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Wang Xuerui <git@xen0n.name>
Warren Fernandes <warren.f.fernandes@gmail.com>
Wayne Ashley Berry <wayneashleyberry@gmail.com>

Wedson Almeida Filho <wedsonaf@google.com>
Weerasak Chongnguluam <singpor@gmail.com>
Wi Cngru <crvv.mail@gmail.com>
Wei Fu <fhfuwei@163.com>
Wei Guangjing <vcc.163@gmail.com>
Wei Xiao <wei.xiao@arm.com>
Wei Xikai <xykwei@gmail.com>
Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>
Wil Selwood <wselwood@gmail.com>
Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
William Poussier <william.poussier@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xiangdong Ji <xiangdong.ji@arm.com>
Xing Xing <mikespook@gmail.com>
Xingqiang Bai <bxq2011hust@qq.com>
Xu Fei <badgangkiller@gmail.com>
Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Hau <vulxj0j8j8@gmail.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherv@gmail.com>
Yann Salan <yannsalaun1@gmail.com>
Yannic Bonenberger <contact@yannic-bonenberger.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yaroslav Vorobiov <yar.vorobiov@gmail.com>
Yasha Bubnov <girokompas@gmail.com>

Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>
Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <ylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>
Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>
Yorman Arias <cixtords@gmail.com>
Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>
Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuichi Kishimoto <yk2220s@gmail.com>
Yuichi Nishiwaki <yuichi.nishiwaki@gmail.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
Yukihiro Nishinaka <6elpinal@gmail.com>
Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zach Bintliff <zbintliff@gmail.com>
Zach Gershman <zachgersh@gmail.com>
Zach Jones <zachj1@gmail.com>
Zachary Amsden <zach@thundertoken.com>
Zachary Gershman <zgershman@pivotal.io>
Zak <zrjknill@gmail.com>
Zakatell Kanda <hi@zkanda.io>
Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>
Zev Goldstein <zev.goldstein@gmail.com>
Zhang Boyang <zhangboyang.id@gmail.com>
Zheng Dayu <davidzheng23@gmail.com>
Zheng Xu <zheng.xu@arm.com>
Zhengyu He <hzy@google.com>
Zhongpeng Lin <zplin@uber.com>
Zhongtao Chen <chenzhongtao@126.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Zhou Peng <p@ctruple.cn>
Ziad Hatahet <hatahet@gmail.com>
Ziheng Liu <lzhfrommustc@gmail.com>

Zorion Arrizabalaga <zorionk@gmail.com>

<a.maksadbek@gmail.com>

<max.faceless.frei@gmail.com>

<hagen1778@gmail.com>

<tbunyk@gmail.com>

<faxriddinjon@gmail.com>

<zs349596@gmail.com>

<bronze1man@gmail.com>

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1.55 pytest 6.2.1

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1.56 react-day-picker 7.4.8

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1.57 pixman 0.32.6

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1.58 importlib-metadata 0.18

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1.59 sizeof 0.3.0

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1.60 asm 5.0.4

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- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/package.html
- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/package.html
- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/signature/package.html
- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/package.html
- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/package.html

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jar/org/objectweb/asm/xml/SAXClassAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/xml/SAXAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/xml/SAXAnnotationAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/Processor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/xml/SAXFieldAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/xml/ASMContentHandler.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/xml/SAXCodeAdapter.java

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*/
/**

* Creates a new JSRInliner. *<i>Subclasses must not use this
* constructor</i>. Instead, they must use the
* { @link #JSRInlinerAdapter(int, MethodVisitor, int, String, String, String, String[])}
* version.
*
* @param mv
* the `MethodVisitor` to send the resulting inlined
* method code to (use `null` for none).
* @param access
* the method's access flags (see { @link Opcodes}). This
* parameter also indicates if the method is synthetic and/or
* deprecated.
* @param name
* the method's name.
* @param desc
* the method's descriptor (see { @link Type}).
* @param signature
* the method's signature. May be `null`.
* @param exceptions
* the internal names of the method's exception classes (see
* { @link Type#getInternalName() getInternalName}). May be
* `null`.
* @throws IllegalStateException
* If a subclass calls this constructor.
/

Found in path(s):

* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/commons/JSRInlinerAdapter.java

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*/

/**

* Creates a new { @link GeneratorAdapter}. *<i>Subclasses must not use this
* constructor</i>. Instead, they must use the
* { @link #GeneratorAdapter(int, MethodVisitor, int, String, String)}
* version.*

*
* @param mv
* the method visitor to which this adapter delegates calls.

* @param access
* the method's access flags (see { @link Opcodes}).

* @param name
* the method's name.

* @param desc
* the method's descriptor (see { @link Type Type}).

* @throws IllegalStateException
* If a subclass calls this constructor.

*/

Found in path(s):

* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
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*/

/**

* Constructs a new { @link Textifier}. *<i>*Subclasses must not use this
* constructor*</i>*. Instead, they must use the { @link #Textifier(int)}
* version.
*
* @throws IllegalStateException
* If a subclass calls this constructor.
*/

Found in path(s):

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```

```
*/
```

```
/**
```

```
 * Constructs a new {@link ClassNode}. <i>Subclasses must not use this
 * constructor</i>. Instead, they must use the {@link #ClassNode(int)}
 * version.
 *
 * @throws IllegalStateException
 *         If a subclass calls this constructor.
 */
```

Found in path(s):

```
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/ClassNode.java
```

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 */
```

```

/**
 * Constructs a new {@link LocalVariableAnnotationNode}. <i>Subclasses must
 * not use this constructor</i>. Instead, they must use the
 * {@link #LocalVariableAnnotationNode(int, TypePath, LabelNode[], LabelNode[], int[], String)}
 * version.
 *
 * @param typeRef
 *     a reference to the annotated type. See {@link TypeReference}.
 * @param typePath
 *     the path to the annotated type argument, wildcard bound, array
 *     element type, or static inner type within 'typeRef'. May be
 *     <tt>null</tt> if the annotation targets 'typeRef' as a whole.
 * @param start
 *     the first instructions corresponding to the continuous ranges
 *     that make the scope of this local variable (inclusive).
 * @param end
 *     the last instructions corresponding to the continuous ranges
 *     that make the scope of this local variable (exclusive). This
 *     array must have the same size as the 'start' array.
 * @param index
 *     the local variable's index in each range. This array must have
 *     the same size as the 'start' array.
 * @param desc
 *     the class descriptor of the annotation class.
 */

```

Found in path(s):

```

* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/AnnotationWriter.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/NameMapping.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/Printer.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/Method.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckAnnotationAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingSignatureAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingFieldAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassWriter.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/MethodInsnNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/MethodVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceFieldVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SourceValue.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/AdviceAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/Remapper.java

* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/BasicValue.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/FieldWriter.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/FieldInsnNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LabelNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/ClassConstantsCollector.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckSignatureAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/BasicVerifier.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/CodeSizeEvaluator.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/InstructionAdapter.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassReader.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingMethodAdapter.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/StaticInitMerger.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/AnnotationConstantsCollector.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/AnnotationVisitor.java
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/JarOptimizer.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/LocalVariablesSorter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceAnnotationVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/Constant.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TypeAnnotationNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Handle.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TryCatchBlockNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/ClassOptimizer.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/ASMifier.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceClassVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TableSwitchInsnNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Frame.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InvokeDynamicInsnNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/AnalyzerException.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Subroutine.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/SerialVersionUIDAdder.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InnerClassNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/ParameterNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LocalVariableNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Analyzer.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SmallSet.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingAnnotationAdapter.java

* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TypeInsnNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceSignatureVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InsnNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/MethodOptimizer.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckFieldAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Frame.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckMethodAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/SimpleRemapper.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/AnnotationNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/FieldVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Context.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceMethodVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/MethodConstantsCollector.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Handler.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/MethodNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InsnList.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/FieldConstantsCollector.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/MethodWriter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/BasicInterpreter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/signature/SignatureWriter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/TryCatchBlockSorter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Item.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Edge.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/FrameNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/ConstantPool.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Opcodes.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckClassAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/signature/SignatureVisitor.java

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```
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/ASMifiable.java
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*/
/**
 * Creates a new {@link AnalyzerAdapter}. <i>Subclasses must not use this
 * constructor</i>. Instead, they must use the
 * {@link #AnalyzerAdapter(int, String, int, String, String, MethodVisitor)}
 * version.
 *
 * @param owner
 *         the owner's class name.
 * @param access
 *         the method's access flags (see {@link Opcodes}).
 * @param name
 *         the method's name.
 * @param desc
 *         the method's descriptor (see {@link Type Type}).
 * @param mv
 *         the method visitor to which this adapter delegates calls. May
 *         be <tt>null</tt>.
 * @throws IllegalStateException
 *         If a subclass calls this constructor.
 */

```

Found in path(s):

```

* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
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- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/shrink-frames.properties

- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/shrink-resize.properties

- * /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/shrink-signatures.properties

```
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/optimizer/shrink.properties  
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/shrink-  
writer.properties
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* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/TypeReference.java
```

1.61 boost 1.71.0-6ubuntu6

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Aleksey Gurtovoy (agurtovoy@meta-comm.com)

Andrei Alexandrescu (andrewalex - at - hotmail.com) (See Boost list message of August 12, 2004 11:06:58 AM EST)

Andrew Lumsdaine ()

Anthony Williams (anthony -at- justsoftwaresolutions.co.uk)

Beman Dawes (bdawes@acm.org)

Brad King (brad.king -at- kitware.com) (See Boost list message of Wed, 21 Jul 2004 11:15:46 -0400)

Brian Osman (osman -at- vvisions.com) (See CVS log)

Bruce Barr (schmoost -at- yahoo.com) (See Boost list of Mon, 16 Aug 2004 15:06:43 -0500)

Bruno da Silva de Oliveira (bruno - at - esss.com.br)

Christain Engstrom (christian.engstrom -at- glindra.org) (See Boost list message of Mon, 30 Aug 2004 14:31:49 +0200)

Cromwell D Enage (sponage -at- yahoo.com) (See Boost list message of August 12, 2004 11:49:13 AM EST)

Dan Gohman (djk -at- cray.com) (See Boost list message of Sat, 21 Aug 2004 10:54:59 +0100)

Dan Nuffer (dan -at- nuffer.name)

Daniel Frey (d.frey -at- gmx.de, daniel.frey -at- aixigo.de)

Daniel Nuffer (dan -at- nuffer.name)

Darin Adler (darin -at- bentspoon.com) (Email to Andreas Huber, see change log)

Daryle Walker (darylew - at - hotmail.com)

Dave Abrahams (dave@boost-consulting.com)

Dave Moore (dmoore -at- viefinancial.com) (See Boost list message of 18 Dec 2003 15:35:50 -0500)

David Abrahams (dave@boost-consulting.com)

Dietmar Kuehl (dietmar_kuehl -at- yahoo.com) (Email to Andreas Huber, see change log)

Douglas Gregor (gregod -at- cs.rpi.edu, dgregor -at- cs.indiana.edu, doug.gregor -at- gmail.com)

Dr John Maddock (john - at - johnmaddock.co.uk)

Edward D. Brey (brey -at- ductape.net) (Email to Andreas Huber, see change log)
Eric Ford (un5o6n902 -at- sneakemail.com) (See Boost list message of Sun, 15 Aug 2004 10:29:13 +0100)
Eric Friedman (ebf@users.sourceforge.net)
Eric Niebler (eric@boost-consulting.com)
Fernando Cacciola (fernando_cacciola@ciudad.com.ar)
Fernando Luis Cacciola Carballal (fernando_cacciola@ciudad.com.ar)
Francois Faure (Francois.Faure -at- imag.fr) (See CVS log)
Gary Powell (powellg - at - amazon.com) (See Boost list message of 10 Feb 2004 14:22:46 -0800)
Gennadiy Rozental (rogeeff -at- mail.com) (Email to Andreas Huber, see change log)
Gottfried Ganssaue (Gottfried.Ganssaue -at- HAUFE.DE) (See Boost List message of Mon, 16 Aug 2004 10:09:19 +0200)
Gottfried Ganaue (Gottfried.Ganssaue -at- HAUFE.DE) (Alternative spelling of Gottfried Ganssaue)
Greg Colvin (gregory.colvin -at- oracle.com) (See Boost list message of Sat, 14 Aug 2004 10:57:00 +0100)
Gregory Colvin (gregory.colvin -at- oracle.com) (See Boost list message of Sat, 14 Aug 2004 10:57:00 +0100)
Gunter Winkler (gunter.winkler -at- unibw-muenchen.de) (See Boost List message of Mon, 16 Aug 2004 10:24:17 +0200)
Hartmut Kaiser (hartmut.kaiser -at- gmail.com)
Herve Bronnimann (hbr -at- poly.edu)
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Housemarque Oy (Ilari Kuittinen ilari.kuittinen -at- housemarque.fi)
Howard Hinnant (hinnant -at- twcnv.r.com) (See Boost list message of July 25, 2004 3:44:49 PM EST)
Hubert Holin (hubert_holin -at- users.sourceforge.net)
Indiana University ()
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Jaakko Jrv (jajarvi -at- osl.iu.edu)
Jaap Suter (j.suter -at- student.utwente.nl) (See Boost list message of Thu, 16 Sep 2004 09:32:43 -0700)
Jeff Garland (jeff - at - crystalclearsoftware.com) (see Boost list post of July 25, 2004 19:31:09 -0700)
Jens Maurer (Jens.Maurer@gmx.net)
Jeremy G Siek (jsiek@osl.iu.edu)
Jeremy Siek (jsiek@osl.iu.edu)
Joel de Guzman (joel -at- boost-consulting.com) (See Boost list message of July 25, 2004 8:32:00 PM EST)
John Bandela (jbandela-at-ufl.edu)
John Maddock (john - at - johnmaddock.co.uk)
John R Bandela (jbandela-at-ufl.edu)
Jonathan Turkanis (turkanis -at- coderage dot com)
Juergen Hunold (hunold -at- ive.uni-hannover.de) (See Boost List Message of Fri, 13 Aug 2004 19:39:55 +0200)
Kevlin Henney (kevin -at- curbralan.com) (See Boost list message of Wed, 15 Sep 2004 18:15:17 +0200)
Kresimir Fresl (fresl -at- master.grad.hr) (See Boost List message of August 16, 2004 8:23:35 AM EST)
Lars Gullik Bjnnes (larsbj -at- lyx.org) (See Boost list message of Tue, 17 Aug 2004 15:49:02 +0100)
Lie-Quan Lee (liequan - at - slac.stanford.edu, llee - at - cs.indiana.edu)
Maarten Keijzer (mkeijzer -at- cs.vu.nl) (See Boost list message of Wed, 18 Aug 2004 21:43:18 +0100)
Mac Murrett (mmurrett -at- mac.com)
Marc Wintermantel (wintermantel -at- imes.mavt.ethz.ch, wintermantel -at- even-ag.ch) (See CVS log)
Michael Glassford (glassfordm - at - hotmail.com)
Michael Stevens (Michael.Stevens - at - epost.de)
Multi Media Ltd. (pdimov@mmltd.net)
Nicolai M Josuttis (solutions -at- josuttis.com) (See Boost list message of Mon, 30 Aug 2004 10:52:00 +0100)
Nikolay Mladenov (nickm -at- sitius.com) (See Boost list message of Tue, 17 Aug 2004 15:45:33 +0100)

Paul Mensonides (pmenso57 -at- comcast.net) (See Boost list message of July 21, 2004 1:12:21 AM EST)
Pavol Droba (droba -at- topmail.sk)
Peter Dimov (pdimov@mmltd.net)
R W Grosse-Kunstleve (RWGrosse-Kunstleve@lbl.gov)
Ralf W. Grosse-Kunstleve (RWGrosse-Kunstleve@lbl.gov)
Rational Discovery LLC (Greg Landrum Landrum -at- RationalDiscovery.com) (See Boost list post of Tue, 17 Aug 2004 10:35:36 +0100)
Rene Rivera (grafik/redshift-software.com, rrivera/acm.org)
Robert Ramey (ramey@www.rrsd.com)
Roland Richter (roland -at- fill.jku.at) (See Boost list post of Mon, 16 Aug 2004 22:16:55 +0200)
Roland Schwarz (roland.schwarz -at- chello.at)
Ronald Garcia (garcia -at- cs.indiana.edu) (Email to Andreas Huber, see change log)
Samuel Krempp (krempp -at- crans.ens-cachan.fr) (See Boost list message of Mon, 27 Sep 2004 13:18:36 +0200)
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Sylvain Pion (Sylvain.Pion - at - sophia.inria.fr)
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Toon Knapen (toon dot knapen - at - fft.be)
Trustees of Indiana University ()
University of Notre Dame ()
Vladimir Prus (ghost@cs.msu.su)
William E. Kempf () (email to Beman Dawes, 9/14/2006 4:18 PM)
Joerg Walter (jhr.walter - at - t-online.de : email to ublas mailing list Mon, 17 Sep 2007 10:17:08 +0200)
Mathias Koch (mkoch - at - idesis.de 7 : email to boost-owner@lists.boost.org Sep 2007 13:20:09 +0200)

--- end ---

1.62 netty-transport-native-epoll 4.1.51.Final

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* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/AbstractEpollStreamChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollDomainSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollEventArray.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollServerDomainSocketChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollMode.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/TcpMd5Util.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollRecvByteAllocatorStreamingHandle.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/AbstractEpollServerChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollServerChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollRecvByteAllocatorHandle.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollDomainSocketChannel.java

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/**

- * Set the { @code TCP_MD5SIG } option on the socket. See { @code linux/tcp.h } for more details.
- * Keys can only be set on, not read to prevent a potential leak, as they are confidential.
- * Allowing them being read would mean anyone with access to the channel could get them.
- */

Found in path(s):

* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollServerSocketChannelConfig.java

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/**

* Set the { @code TCP_MD5SIG } option on the socket. See { @code linux/tcp.h } for more details.

* Keys can only be set on, not read to prevent a potential leak, as they are confidential.

```
* Allowing them being read would mean anyone with access to the channel could get them.
*/
/**
 * Set the { @code TCP_QUICKACK } option on the socket. See <a
href="http://linux.die.net/man/7/tcp">TCP_QUICKACK</a>
 * for more details.
*/
```

Found in path(s):

```
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/NativeDatagramPacketArray.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollDatagramChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/Epoll.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/package-info.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollServerSocketChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollEventLoop.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollEventLoopGroup.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollChannelOption.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/AbstractEpollChannel.java
```

* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollSocketChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollTcpInfo.java
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* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/netty_epoll_native.c
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* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollDatagramChannelConfig.java

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*/opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/netty_epoll_linuxsocket.c
*/opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/netty_epoll_linuxsocket.h
*/opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/LinuxSocket.java
*/opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/NativeStaticallyReferencedJniMethods.java
```

1.63 util-linux 2.20

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* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/UUIDSchema.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/info/License.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/XML.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/info/Info.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/DateSchema.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/MediaType.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/servers/ServerVariables.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/parameters/PathParameter.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/info/Contact.java
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* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/EmailSchema.java
* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/Components.java
* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/OpenAPI.java
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* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/PathItem.java

* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/IntegerSchema.java
* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/Schema.java
* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/parameters/QueryParameter.java
* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/ArraySchema.java
* /opt/cola/permits/1165124349_1620941204.65/0/swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/security/SecurityRequirement.java

1.66 json-c 0.12.1

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1.67 libmnl 1.0.3

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30 ctime=1338052482.808834269

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Version 2.1, February 1999

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1.68 ethtool 3.2

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*/opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
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*/opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
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jar/org/springframework/retry/annotation/AnnotationAwareRetryOperationsInterceptor.java

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* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/SimpleRetryPolicy.java

* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/classify/SubclassClassifier.java

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jar/org/springframework/retry/annotation/Recover.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/annotation/Backoff.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
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jar/org/springframework/retry/stats/RetryStatisticsFactory.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/stats/StatisticsListener.java
```

* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/DefaultStatisticsRepository.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/ExponentialAverageRetryStatistics.java
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- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/ExceptionClassifierRetryPolicy.java
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- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/ExhaustedRetryException.java
- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/RetryCacheCapacityExceededException.java
- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/classify/PatternMatchingClassifier.java
- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/classify/annotation/Classifier.java
- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/classify/BackToBackPatternClassifier.java
- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/support/RetrySimulator.java
- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/SoftReferenceMapRetryContextCache.java
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- * /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/RetryPolicy.java
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* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
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* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
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jar/org/springframework/retry/support/DefaultRetryState.java

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jar/org/springframework/retry/support/RetryTemplate.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/backoff/FixedBackOffPolicy.java
```

* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/backoff/ExponentialBackOffPolicy.java

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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/expression/MethodBasedEvaluationContext.java
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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jndi/JndiLocatorSupport.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/support/FileSystemXmlApplicationContext.java
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/support/FormattingConversionService.java

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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/validation/AbstractBindingResult.java

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jar/org/springframework/validation/MapBindingResult.java
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 */
/**
 * {@link FactoryBean} that obtains a WebSphere {@link javax.management.MBeanServer}
 * reference through WebSphere's proprietary {@code AdminServiceFactory} API,
 * available on WebSphere 5.1 and higher.
 *
 * <p>Exposes the {@code MBeanServer} for bean references.
 *
 * <p>This {@code FactoryBean} is a direct alternative to {@link MBeanServerFactoryBean},
 * which uses standard JMX 1.2 API to access the platform's {@link MBeanServer}.
 */
```

```
* <p>See the javadocs for WebSphere's
* <a
href="https://www.ibm.com/support/knowledgecenter/SSEQTJ_9.0.0/com.ibm.websphere.javadoc.doc/web/apidocs
/com/ibm/websphere/management/AdminServiceFactory.html">{ @code AdminServiceFactory }</a>
* and
* <a
href="https://www.ibm.com/support/knowledgecenter/SSEQTJ_9.0.0/com.ibm.websphere.javadoc.doc/web/apidocs
/com/ibm/websphere/management/MBeanFactory.html">{ @code MBeanFactory }</a>.
*
* @author Juergen Hoeller
* @author Rob Harrop
* @since 2.0.3
* @see javax.management.MBeanServer
* @see MBeanServerFactoryBean
*/
```

Found in path(s):

```
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jmx/support/WebSphereMBeanServerFactoryBean.java
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jar/org/springframework/jmx/export/metadata/ManagedOperation.java
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jar/org/springframework/context/LifecycleProcessor.java
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/format/number/money/CurrencyUnitFormatter.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/scripting/ScriptEvaluator.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/validation/beanvalidation/SpringConstraintValidatorFactory.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/PayloadApplicationEvent.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ImportResource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/annotation/CacheConfig.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/format/datetime/joda/PeriodFormatter.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/format/datetime/joda/YearMonthFormatter.java
```

* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/joda/DurationFormatter.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/annotation/ManagedOperation.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/ComponentScans.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/annotation/ManagedNotification.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/number/PercentStyleFormatter.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/Role.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scripting/config/LangNamespaceHandler.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/annotation/ManagedResource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/event/EventListenerFactory.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/joda/MonthDayFormatter.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scripting/support/StandardScriptEvalException.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/annotation/ManagedOperationParameter.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/config/AnnotationDrivenBeanDefinitionParser.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/annotation/ManagedMetric.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/support/CronTrigger.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/annotation/ManagedOperationParameters.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/remoting/RemoteTimeoutException.java
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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/metadata/AbstractJmxAttribute.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/support/NoOpCache.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/support/PostProcessorRegistrationDelegate.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/number/money/Jsr354NumberFormatAnnotationFormatterFactory.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/LoadTimeWeavingConfiguration.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/ConfigurableApplicationContext.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/validation/beanvalidation/MethodValidationInterceptor.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/support/AbstractResourceBasedMessageSource.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/concurrent/ThreadPoolTaskExecutor.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/interceptor/SimpleKey.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scripting/groovy/GroovyScriptFactory.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/ejb/config/AbstractIndiLocatingBeanDefinitionParser.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/Configuration.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/annotation/ScheduledAnnotationBeanPostProcessor.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/AnnotationBeanNameGenerator.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/ComponentScan.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/concurrent/ExecutorConfigurationSupport.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/concurrent/ConcurrentMapCacheManager.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/expression/StandardBeanExpressionResolver.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/annotation/ManagedAttribute.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-

jar/org/springframework/context/annotation/MBeanExportConfiguration.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/scheduling/concurrent/ConcurrentTaskExecutor.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ConfigurationClassBeanDefinitionReader.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/support/NoOpCacheManager.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/CommonAnnotationBeanPostProcessor.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/AutoProxyRegistrar.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/interceptor/CacheAspectSupport.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/support/AbstractApplicationContext.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/support/AbstractRefreshableApplicationContext.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/DeferredImportSelector.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jmx/support/RegistrationPolicy.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jmx/export/ assembler/InterfaceBasedMBeanInfoAssembler.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/AnnotationConfigApplicationContext.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/FullyQualifiedAnnotationBeanNameGenerator.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/validation/beanvalidation/MethodValidationPostProcessor.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/PropertySource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ConfigurationClassPostProcessor.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/concurrent/ConcurrentMapCache.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ConfigurationClassParser.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/scheduling/concurrent/DefaultManagedTaskExecutor.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ClassPathScanningCandidateComponentProvider.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/index/CandidateComponentsIndex.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ScannedGenericBeanDefinition.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ImportSelector.java

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jar/org/springframework/context/Phased.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/ejb/config/LocalStatelessSessionBeanDefinitionParser.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/scheduling/SchedulingException.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jmx/access/InvalidInvocationException.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jmx/export/MBeanExporterListener.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/instrument/classloading/LoadTimeWeaver.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/weaving/LoadTimeWeaverAware.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/validation/beanvalidation/LocaleContextMessageInterpolator.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/scheduling/TriggerContext.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/HierarchicalMessageSource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/config/ContextNamespaceHandler.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/remoting/support/DefaultRemoteInvocationFactory.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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jar/org/springframework/ejb/access/EjbAccessException.java
 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
 jar/org/springframework/scripting/ScriptSource.java
 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
 jar/org/springframework/ejb/config/JeeNamespaceHandler.java
 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
 jar/org/springframework/remoting/soap/SoapFaultException.java
 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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 * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
 jar/org/springframework/jmx/export/metadata/InvalidMetadataException.java
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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/instrument/classloading/SimpleInstrumentableClassLoader.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/instrument/classloading/SimpleThrowawayClassLoader.java

* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/metadata/ManagedResource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/interceptor/CacheErrorHandler.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/NotificationListenerBean.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/stereotype/Controller.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/instrument/classloading/SimpleLoadTimeWeaver.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/stereotype/Service.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/config/TriggerTask.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/remoting/rmi/JndiRmiProxyFactoryBean.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/concurrent/DefaultManagedTaskScheduler.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/naming/MetadataNamingStrategy.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scripting/support/StaticScriptSource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/Js330ScopeMetadataResolver.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/number/CurrencyStyleFormatter.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/interceptor/SimpleCacheErrorHandler.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/expression/BeanFactoryAccessor.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/concurrent/ReschedulingRunnable.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/config/ScheduledTaskHolder.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/validation/beanvalidation/CustomValidatorBean.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jndi/TypeMismatchNamingException.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/number/NumberFormatAnnotationFormatterFactory.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/config/FixedDelayTask.java
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/DateFormatterRegistrar.java
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/metadata/ManagedNotification.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/stereotype/Repository.java
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/metadata/ManagedMetric.java
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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/ImportAware.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/ApplicationEventPublisherAware.java

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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/ApplicationContext.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/validation/beanvalidation/MessageSourceResourceBundleLocator.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/PropertySources.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/config/ContextLifecycleScheduledTaskRegistrar.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/validation/annotation/Validated.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/interceptor/BasicOperation.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/annotation/AsyncConfigurerSupport.java

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* limitations under the License.
*/
/**
* Indicates that a component is only eligible for registration when all
* { @linkplain #value specified conditions } match.
*
* <p>A <em>condition</em> is any state that can be determined programmatically
* before the bean definition is due to be registered (see { @link Condition } for details).
*
* <p>The { @code @Conditional } annotation may be used in any of the following ways:
* <ul>
* <li>as a type-level annotation on any class directly or indirectly annotated with
* { @code @Component }, including { @link Configuration @Configuration } classes</li>
* <li>as a meta-annotation, for the purpose of composing custom stereotype
* annotations</li>
* <li>as a method-level annotation on any { @link Bean @Bean } method</li>
* </ul>
*
* <p>If a { @code @Configuration } class is marked with { @code @Conditional },
* all of the { @code @Bean } methods, { @link Import @Import } annotations, and
* { @link ComponentScan @ComponentScan } annotations associated with that
* class will be subject to the conditions.
*
* <p><strong>NOTE</strong>: Inheritance of { @code @Conditional } annotations
* is not supported; any conditions from superclasses or from overridden
* methods will not be considered. In order to enforce these semantics,
* { @code @Conditional } itself is not declared as
* { @link java.lang.annotation.Inherited @Inherited }; furthermore, any
* custom <em>composed annotation</em> that is meta-annotated with
* { @code @Conditional } must not be declared as { @code @Inherited }.
*
* @author Phillip Webb
* @author Sam Brannen
* @since 4.0
* @see Condition
*/

```

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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/Conditional.java

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*/

/**

* Abstract the invocation of a cache operation.

*

* <p>Does not provide a way to transmit checked exceptions but

* provide a special exception that should be used to wrap any

* exception that was thrown by the underlying invocation.

* Callers are expected to handle this issue type specifically.

*

* @author Stephane Nicoll

* @since 4.1

*/

Found in path(s):

* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/interceptor/CacheOperationInvoker.java

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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/validation/beanvalidation/OptionalValidatorFactoryBean.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/joda/ReadablePartialPrinter.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/joda/LocalDateTimeParser.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/FilterType.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/Description.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/joda/MillisecondInstantPrinter.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/i18n/TimeZoneAwareLocaleContext.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/joda/LocalDateParser.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/concurrent/CustomizableThreadFactory.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/datetime/joda/ReadableInstantPrinter.java
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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/support/MessageSourceResourceBundle.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/Lazy.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/i18n/LocaleContext.java

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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/support/StaticMessageSource.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/instrument/classloading/jboss/JBossLoadTimeWeaver.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/ui/ModelMap.java
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- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/validation/beanvalidation/SpringValidatorAdapter.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/support/TaskUtils.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/config/PropertyPlaceholderBeanDefinitionParser.java
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/AnnotationConfigApplicationContextExtensions.kt
- * /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/config/ScheduledTaskRegistrar.java
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* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/annotation/SpringCacheAnnotationParser.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/instrument/classloading/InstrumentationLoadTimeWeaver.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/CacheManager.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/scheduling/annotation/Scheduled.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/support/GenericApplicationContext.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/event/EventListener.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-

jar/org/springframework/context/weaving/DefaultContextLoadTimeWeaver.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/support/AbstractCacheManager.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/ImportBeanDefinitionRegistrar.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/AnnotatedBeanDefinitionReader.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jndi/JndiTemplateEditor.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/annotation/Import.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jmx/support/MBeanServerConnectionFactoryBean.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/event/EventExpressionEvaluator.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/interceptor/CacheProxyFactoryBean.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/interceptor/CacheOperationSourcePointcut.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jmx/support/MBeanServerFactoryBean.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/validation/DataBinder.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/event/AbstractApplicationEventMulticaster.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/support/GenericApplicationContextExtensions.kt
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/interceptor/CacheOperationSource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/validation/ObjectError.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/context/ApplicationEvent.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
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jar/org/springframework/context/support/DefaultMessageSourceResolvable.java
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jar/org/springframework/cache/annotation/AnnotationCacheOperationSource.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/annotation/CacheAnnotationParser.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/cache/interceptor/CompositeCacheOperationSource.java

1.71 opencv 4.1.1

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      <_>
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      </_>
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  <!-- tree 4 -->
  </_>

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    <_>
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    <!-- tree 0 -->
    <_>
      <!-- root node -->
      <feature>
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          <_>
            31 4 11 2 3.</_></rects>
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    <!-- tree 1 -->
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      <!-- root node -->
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    <_>

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    <_>
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<!-- root node -->
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<!-- root node -->
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<!-- stage 3 -->
<trees>
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<!-- tree 0 -->
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        56 0 3 3 2.</_>
      <_>
        59 3 3 3 2.</_></rects>
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    <!-- root node -->
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        <_>
          32 0 7 6 2.</_>
        <_>
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      <!-- root node -->
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      <!-- tree 3 -->
      <_>

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    <_>
      44 10 10 5 3.</_></rects>
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<!-- root node -->
<feature>
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      3 9 3 5 3.</_></rects>
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      <_>

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<!-- root node -->
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      36 4 7 4 2.</_>
    <_>
      43 8 7 4 2.</_></rects>
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<!-- tree 2 -->
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  <feature>
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        53 12 9 3 2.</_></rects>
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<!-- tree 3 -->
<_>
  <!-- root node -->
  <feature>
    <rects>
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    13 4 3 3 3.</_></rects>
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      <_>
        45 4 5 4 2.</_></rects>
    <tilted>0</tilted></feature>
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    <right_val>-8.0651968717575073e-001</right_val></_></_>
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<!-- tree 5 -->
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  <!-- root node -->
  <feature>
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      <_>
        17 15 47 1 2.</_></rects>
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  <!-- root node -->
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  <!-- root node -->
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      <_>
      0 0 3 3 2.</_>
      <_>
      3 3 3 3 2.</_></rects>
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  <!-- root node -->
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<!-- root node -->
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    31 8 1 5 3.</_></rects>
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</>
<!-- root node -->
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    </>
    55 13 8 3 2.</_></rects>
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                6 6 2 7 2.</_></rects>
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              <!-- root node -->
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                    <_>
                      59 3 3 8 2.</_></rects>
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              <_>
                <!-- tree 2 -->
                  <_>
                    <!-- root node -->
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                        <rects>
                          <_>
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                          <_>
                            37 4 4 2 3.</_></rects>
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                    <_>

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<!-- tree 3 -->
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  <!-- root node -->
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      <_>
        0 12 30 2 3.</_></rects>
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  <_>
  <!-- tree 4 -->
  <_>
    <!-- root node -->
    <feature>
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        <_>
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        <_>
          7 4 7 12 3.</_></rects>
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  <_>
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    <_>
      <!-- root node -->
      <feature>
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          <_>
            44 7 1 7 2.</_></rects>
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      <_>

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<!-- tree 1 -->
<_>
  <!-- root node -->
  <feature>
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      <_>
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      <_>
        56 3 2 3 2.</_></rects>
    <tilted>0</tilted></feature>
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<_>
<!-- tree 2 -->
<_>
  <!-- root node -->
  <feature>
    <rects>
      <_>
        32 0 30 6 -1.</_>
      <_>
        32 0 15 3 2.</_>
      <_>
        47 3 15 3 2.</_></rects>
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<_>
<!-- tree 3 -->
<_>
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  <feature>
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      <_>
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      <_>
        3 8 3 7 3.</_></rects>
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<_>
<!-- tree 4 -->
<_>
  <!-- root node -->
  <feature>

```

```

    <rects>
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      <_>
        31 10 1 3 3.</_></rects>
    <tilted>0</tilted></feature>
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    <!-- tree 5 -->
  <_>
    <!-- root node -->
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        <_>
          29 3 8 4 3.</_></rects>
      <tilted>0</tilted></feature>
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      <left_val>-9.2727631330490112e-001</left_val>
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    <_>
      <!-- tree 6 -->
    <_>
      <!-- root node -->
      <feature>
        <rects>
          <_>
            42 3 12 6 -1.</_>
          <_>
            46 3 4 6 3.</_></rects>
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    <next>-1</next></_>
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    <_>
      <!-- root node -->
      <feature>

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```

    <rects>
      <_>
        56 9 6 6 -1.</_>
      <_>
        59 9 3 6 2.</_></rects>
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      <!-- root node -->
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      <!-- root node -->
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  <feature>

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          <!-- tree 1 -->
          <_>
            <!-- root node -->
            <feature>

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    <rects>
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<!-- tree 13 -->
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John R. Hauser

2017 February 10

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ring;)Ljava/lang/StringBuffer;(Ljava/lang/String;Ljava/lang/String;)VE([Lorg/apache/ivy/core/module/id/ModuleR
evisionId;)Ljava/lang/String;->...<init>CircularDependencyHelper.javaCodeLineNumberTableLjava/lang/String;
SourceFileaddappend
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1.74 unbound 1.5.10

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1.76 hibernate-validator 6.1.5.Final

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1.77 icu 66.1-2ubuntu2

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## Commands to generate dependency files
GEN_DEPS.c= $(CC) -E -MM $(DEFS) $(CPPFLAGS)
GEN_DEPS.cc= $(CXX) -E -MM $(DEFS) $(CPPFLAGS)

## Flags for position independent code
SHAREDLIBCFLAGS = -fPIC
SHAREDLIBCXXFLAGS = -fPIC
SHAREDLIBCPPFLAGS = -DPIC

## Additional flags when building libraries and with threads
THREADSCPPFLAGS = -D_REENTRANT
LIBCPPFLAGS =

## Compiler switch to embed a runtime search path
LD_RPATH=
LD_RPATH_PRE= -Wl,-rpath,

## Compiler switch to embed a library name
LD_SONAME = -Wl,-soname -Wl,$(notdir $(MIDDLE_SO_TARGET))

## Shared library options
LD_SOOPTIONS= -Wl,-Bsymbolic

## Shared object suffix
SO = so
## Non-shared intermediate object suffix
STATIC_O = ao

## Compilation rules
%.${STATIC_O}: $(srcdir)/%.c
```

```

$(COMPILE.c) $(STATICCPPFLAGS) $(STATICCFLAGS) -o $@ $<
%.o: $(srcdir)/%.c
$(COMPILE.c) $(DYNAMICCPPFLAGS) $(DYNAMICCFLAGS) -o $@ $<

%. $(STATIC_O): $(srcdir)/%.cpp
$(COMPILE.cc) $(STATICCPPFLAGS) $(STATICCXXFLAGS) -o $@ $<
%.o: $(srcdir)/%.cpp
$(COMPILE.cc) $(DYNAMICCPPFLAGS) $(DYNAMICCXXFLAGS) -o $@ $<

```

Dependency rules

```

%.d: $(srcdir)/%.c
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.c) $< \
| sed "s^\($*\)\.o[ :]*\1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'

```

```

%.d: $(srcdir)/%.cpp
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.cc) $< \
| sed "s^\($*\)\.o[ :]*\1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'

```

Versioned libraries rules

```

%. $(SO).$(SO_TARGET_VERSION_MAJOR): %. $(SO).$(SO_TARGET_VERSION)
$(RM) $@ && ln -s ${<F} $@
%. $(SO): %. $(SO).$(SO_TARGET_VERSION_MAJOR)
$(RM) $@ && ln -s ${*F}. $(SO).$(SO_TARGET_VERSION) $@

```

Bind internal references

```

# LDflags that pkgdata will use
BIR_LDFLAGS= -Wl,-Bsymbolic

```

```

# Dependencies [i.e. map files] for the final library
BIR_DEPS=

```

```

## Remove shared library 's'
STATIC_PREFIX_WHEN_USED =
STATIC_PREFIX =

```

```

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1.79 postgresql 12.4

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1.80 classgraph 4.8.69

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1.81 ehcache-107 3.8.1

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- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/config/Jsr107Configuration.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107MXBean.java
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- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107CompleteConfiguration.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107Configuration.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107CacheManager.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/DefaultJsr107Service.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/DefaultConfigurationResolver.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107ReverseConfiguration.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/EventListenerAdaptors.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/config/package-info.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/Jsr107CacheLoaderWriter.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/CloseUtil.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107CacheLoaderWriterProvider.java
- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/package-info.java
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- * /opt/cola/permits/1135872828_1613621005.88/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/tck/Eh107MBeanServerBuilder.java
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* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/WrappedCacheLoaderWriter.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/config/Jsr107CacheConfiguration.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107CacheMXBean.java
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* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/Jsr107ServiceConfigurationParser.java
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* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/Jsr107CacheConfigurationParser.java
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* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107Cache.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Unwrap.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107CacheLoaderWriter.java

1.82 pcre 8.39-12build1

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Written by: Philip Hazel
Email local part: ph10
Email domain: cam.ac.uk

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1.84 spring-boot 2.3.3.RELEASE

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Spring Boot CLI

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>>> net.sf.jopt-simple:jopt-simple:4.5

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>>> org.ow2.asm:asm

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>>> org.apache.httpcomponents:httpcore
>>> org.sonatype.plexus:plexus-cipher
>>> org.sonatype.plexus:plexus-sec-dispatcher
>>> commons-logging:commons-logging
>>> org.codehaus.groovy:groovy
>>> org.apache.maven:maven-aether-provider
>>> org.apache.maven:maven-model
>>> org.apache.maven:maven-model-builder
>>> org.apache.maven:maven-repository-metadata
>>> org.apache.maven:maven-settings
>>> org.apache.maven:maven-settings-builder
>>> org.codehaus.plexus:plexus-component-annotations
>>> org.codehaus.plexus:plexus-utils
>>> org.codehaus.plexus:plexus-component-api
>>> org.codehaus.plexus:plexus-interpolation
```

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```
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```

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```
>>> org.eclipse.aether:aether-api
>>> org.eclipse.aether:aether-connector-basic
>>> org.eclipse.aether:aether-impl
>>> org.eclipse.aether:aether-spi
>>> org.eclipse.aether:aether-transport-file
>>> org.eclipse.aether:aether-transport-http
>>> org.eclipse.aether:aether-util
```

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downloading the Source Files from <https://github.com/spring-projects/spring-boot>,
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1.85 spring-webflux 5.2.8.RELEASE

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```

Found in path(s):

```
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/RequestMappingHandlerMapping.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/RequestMappingHandlerAdapter.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/condition/ParamsRequestCondition.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/AbstractHandlerMethodMapping.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
```

jar/org/springframework/web/reactive/result/method/annotation/ResponseEntityResultHandler.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/BodyInserters.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/ModelAttributeMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/client/DefaultClientResponseBuilder.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/DefaultServerRequest.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/client/DefaultWebClient.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/client/DefaultWebClientBuilder.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/condition/ConsumesRequestCondition.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/config/CorsRegistry.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/ControllerMethodResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/config/WebFluxConfigurationSupport.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/config/DelegatingWebFluxConfiguration.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/client/ReactorNettyWebSocketClient.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/handler/AbstractHandlerMapping.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/condition/HeadersRequestCondition.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/DefaultServerResponseBuilder.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/client/DefaultClientResponse.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/condition/ProducesRequestCondition.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/client/ClientResponse.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/resource/AppCacheManifestTransformer.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/server/upgrade/JettyRequestUpgradeStrategy.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/DefaultServerRequestBuilder.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/RequestMappingInfo.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/RouterFunctionBuilder.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-

jar/org/springframework/web/reactive/result/view/RedirectView.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/RequestPredicates.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/condition/PatternsRequestCondition.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/server/upgrade/ReactorNettyRequestUpgradeStrategy.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/AbstractMessageWriterResultHandler.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/WebSocketMessage.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/PathResourceLookupFunction.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/server/upgrade/TomcatRequestUpgradeStrategy.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/RouterFunctions.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/RequestAttributeMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/ServerRequest.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/client/WebClientUtils.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/client/WebClient.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/resource/ResourceUrlProvider.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/condition/RequestMethodsRequestCondition.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/server/upgrade/UndertowRequestUpgradeStrategy.java
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```
/**
 * A contract for inspecting and potentially modifying request data values such
 * as URL query parameters or form field values before they are rendered by a
 * view or before a redirect.
 *
 * <p>Implementations may use this contract for example as part of a solution
 * to provide data integrity, confidentiality, protection against cross-site
 * request forgery (CSRF), and others or for other tasks such as automatically
 * adding a hidden field to all forms and URLs.
 *
 * <p>View technologies that support this contract can obtain an instance to
 * delegate to via { @link RequestContext#getRequestDataValueProcessor()}.
 *
 * @author Rossen Stoyanchev
 * @since 5.0
 */
```

Found in path(s):

```
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/view/RequestDataValueProcessor.java
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 */
```

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```
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/ExpressionValueMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/adapters/UndertowWebSocketSession.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/MatrixVariableMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/PathVariableMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
```

jar/org/springframework/web/reactive/result/method/annotation/MatrixVariableMapMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/WebSocketHandler.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/condition/CompositeRequestCondition.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/socket/client/TomcatWebSocketClient.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/support/ServerResponseResultHandler.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/UnsupportedMediaTypeException.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/accept/RequestedContentTypeResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/handler/WebFluxResponseStatusExceptionHandler.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/PathVariableMapMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/resource/ResourceResolverChain.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/view/script/RenderingContext.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/config/ResourceHandlerRegistry.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/function/server/ToStringVisitor.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/method/annotation/RequestHeaderMapMethodArgumentResolver.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/view/Rendering.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/view/freemarker/FreeMarkerConfigurer.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/view/HttpMessageWriterView.java
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
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1.88 libxml 2.9.4

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/*

* hash.c: chained hash tables

*

* Reference: Your favorite introductory book on algorithms

*

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*/

/******

*

* \$Id\$

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1.89 e2fsprogs 1.43.1

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*/

Index: tdbsa/tdb.c

--- tdbsa.orig/tdb.c

+++ tdbsa/tdb.c

@@ -4,11 +4,11 @@ Rev: 23371

Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)

*/

/*

- Unix SMB/CIFS implementation.
+ trivial database library - standalone version

- trivial database library - private includes

-

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Theodore Ts'o
23-June-2007

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```

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```
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`Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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Ty Coon, President of Vice

That's all there is to it!

This package was added to the e2fsprogs debian source package by Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

<http://sourceforge.net/projects/e2fsprogs>

Upstream Author: Theodore Ts'o <tytso@mit.edu>

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This is the Debian GNU/Linux prepackaged version of the `ss` command-line interface parsing library. It is currently distributed together with the EXT2 file system utilities, which are otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>, from sources obtained from a mirror of:
tsx-11.mit.edu/pub/linux/packages/ext2fs/

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```
#
# This is a Makefile stub which handles the creation of BSD shared
# libraries.
#
# In order to use this stub, the following makefile variables must be defined.
#
# BSDLIB_VERSION = 1.0
# BSDLIB_IMAGE = libce
# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#
```

```
all:: image
```

```
real-subdirs:: Makefile
```

```
@echo " MKDIR pic"
```

```
@mkdir -p pic
```

```
BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
```

```
BSDLIB_PIC_FLAG = -fpic
```

```
image: $(BSD_LIB)
```

```
$(BSD_LIB): $(OBJS)
```

```
(cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
```

```
$(MV) pic/$(BSD_LIB) .
```

```
$(RM) -f ../$(BSD_LIB)
```

```
(cd ..; $(LN) $(LINK_BUILD_FLAGS) \
```

```
`echo $(my_dir) | sed -e 's;lib/;;' /$(BSD_LIB) $(BSD_LIB))
```

```
install-shlibs install:: $(BSD_LIB)
```

```
@echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
```

```
@$(INSTALL_PROGRAM) $(BSD_LIB) \
```

```
$(DESTDIR)$$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
```

```
@-$(LDCONFIG)
```

```
install-strip: install
```

```
install-shlibs-strip: install-shlibs
```

uninstall-shlibs uninstall::

```
$(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
```

clean::

```
$(RM) -rf pic
```

```
$(RM) -f $(BSD_LIB)
```

```
$(RM) -f ../$(BSD_LIB)
```

This is the Debian GNU/Linux prepackaged version of the Common Error Description library. It is currently distributed together with the EXT2 file system utilities, which are otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>, from sources obtained from a mirror of:
tsx-11.mit.edu:/pub/linux/packages/ext2fs/

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Gadi Oxman, August 1995

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This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
```

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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
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1.90 gson 2.8.6

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```
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/LinkedTreeMap.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/LinkedHashMap.java
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```
 * /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/reflect/PreJava9ReflectionAccessor.java
 * /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/PreJava9DateFormatProvider.java
 * /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/reflect/ReflectionAccessor.java
 * /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/reflect/UnsafeReflectionAccessor.java
 * /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/JavaVersion.java
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 * /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/bind/CollectionTypeAdapterFactory.java
```

* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/TypeAdapters.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/JsonTreeReader.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/ArrayTypeAdapter.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/ObjectTypeAdapter.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/MapTypeAdapterFactory.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/TypeAdapter.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/JsonReaderInternalAccess.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/JsonTreeWriter.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/TypeAdapterFactory.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/ReflectiveTypeAdapterFactory.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/TypeAdapterRuntimeTypeWrapper.java
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* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonPrimitive.java

* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/ExclusionStrategy.java

* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonDeserializer.java

* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/\$Gson\$Preconditions.java

* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/Excluder.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonSerializationContext.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonArray.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/annotations/Since.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/Primitives.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/reflect/TypeToken.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/Gson.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonIOException.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonObject.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonSerializer.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/ObjectConstructor.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonNull.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonDeserializationContext.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonElement.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/GsonBuilder.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/FieldNamingPolicy.java
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* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/annotations/SerializedName.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/annotations/Expose.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/InstanceCreator.java

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jar/com/google/gson/annotations/JsonAdapter.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/internal/bind/JsonAdapterAnnotationTypeAdapterFactory.java
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* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/stream/MalformedJsonException.java
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* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/SqlDateTypeAdapter.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/ConstructorConstructor.java
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* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/UnsafeAllocator.java
* /opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/TreeTypeAdapter.java

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*/opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/JsonSyntaxException.java
*/opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/Streams.java
No license file was found, but licenses were detected in source scan.
```

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Found in path(s):

```
*/opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/LongSerializationPolicy.java
*/opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
jar/com/google/gson/JsonStreamParser.java
*/opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/FieldAttributes.java
*/opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonParser.java
```

1.91 coturn 4.5.1.3

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1.93 pcre 8.42

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1.94 nio-multipart-parser 1.1.0

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1.95 dhcpd 9.1.1

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* /opt/ws_local/PERMITS_SQL/1068228479_1594322464.94/0/hikaricp-3-4-5-sources-
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* /opt/ws_local/PERMITS_SQL/1068228479_1594322464.94/0/hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/metrics/MetricsTracker.java
* /opt/ws_local/PERMITS_SQL/1068228479_1594322464.94/0/hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/HikariJNDIFactory.java

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jar/com/zaxxer/hikari/metrics/prometheus/HikariCPCollector.java

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1.101 pam 1.1.5

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1.103 pluggly 0.13.1

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1.104 lua 5.2.3

1.105 rrule 2.6.8

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rrule.js: Library for working with recurrence rules for calendar dates.

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./rrule.js and ./test/tests.js is based on python-dateutil. LICENCE:

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1.106 go-runtime 1.13.4

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Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
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Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Azarchs <adam.azarchs@10xgenomics.com>
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```

Aeneas Rekkas (arekkas) <aeneas@ory.am>
Afanasev Stanislav <phpprogger@gmail.com>
Agis Anastasopoulos <agis.anast@gmail.com>
Agniva De Sarker <agnivade@yahoo.co.in>
Ahmed Wahed <oneofone@gmail.com>
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Alekseev Artem <a.artem060@gmail.com>
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Alexander F Rdseth <alexander.rodseth@appeartv.com>
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Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Lutomirski <andy@luto.us>
Andrew Pilloud <andrewpilloud@igneoussystem.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>
Andrew Wilkins <axwalk@gmail.com>
Andrew Williams <williams.andrew@gmail.com>
Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
Andrii Soluk <isoluchok@gmail.com>
Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>

Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Walker <walkeraj@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>
Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Anschel Schaffer-Cohen <anschelsc@gmail.com>
Anthony Alves <cvballa3g0@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <ality@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>
Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>
Anton Gyllenberg <anton@iki.fi>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>
Antonio Bibiano <antbbn@gmail.com>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>
Arash Bina <arash@arash.io>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmani <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>

Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>
awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayanamist Yang <ayanamist@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>
Baokun Lee <nototon@gmail.com>
Bartosz Grzybowski <melkorm@gmail.com>
Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>
Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbharath91@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>
Bill Zissimopoulos <billziss@navimatics.com>

Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>
Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradley Falzon <brad@teambrod.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Ryan <bjryan19@gmail.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkennedy@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Bryan Heden <b.heden@gmail.com>

Bulat Gaifullin <gaifullinbf@gmail.com>
Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlisia Campos <carlisia@grokkingtech.io>
Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlosedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Souza <carloshrsouza@gmail.com>
Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Channing Kimble-Brown <channing@golang.org>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Cherry Zhang <cherryz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>
Chris Howey <howeyc@gmail.com>

Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>
Chris Manghane <cmang@golang.org>
Chris Marchesi <chrism@vanclueverttech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clment Chigot <clement.chigot@atos.net>
Clement Skau <clementskau@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>
Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Conrado Gouvea <conradopl@gmail.com>

Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Cosmos Nicolaou <cnicolaou@google.com>
Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrill@schumacher.fm>
Daisuke Fujita <dtanshi45@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damiens.lespiau@gmail.com> <damiens.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damiens@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruzalek@gmail.com>
Danny Rosseau <daniel.rosseau@gmail.com>
Daria Kolistratova <daria.kolistratova@intel.com>
Darien Raymond <admin@v2ray.com>
Darren Elwood <darren@textnode.com>

Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>
David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>
David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>
David Wimmer <davidlwimmer@gmail.com>

Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>
Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvdudd Jadhav <dhrvdudd.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>
Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Domen Ipavec <domen@ipavec.net>
Dominic Green <dominicgreen1@gmail.com>

Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>
Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>
Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliek <efliek@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>
Emerson Lin <linyinitor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>

Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rykwaldler <e.rykwaldler@gmail.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Eugene Kalinin <e.v.kalinin@gmail.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Polyakov <zbr@ioremap.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youreemail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Fedor Korotkiy <dartslon@gmail.com>

Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Filip Gruszczyski <gruszczzy@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>
Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>
Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>
Francisco Souza <franciscossouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Frederik Ring <frederik.ring@gmail.com>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@gaurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Gauthier Jolly <gauthier.jolly@gmail.com>

Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>
George Shammas <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>
Gernot Vormayr <gvormayr@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>
GitHub User @ajnrp (1688456) <ajnrp@users.noreply.github.com>
GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @frenkie (6499251) <mail@rhab.de>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @kazysshr (30496953) <kazysshr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @madiganz (18340029) <zacharywmadigan@gmail.com>
GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @OlgaVIPetrova (44112727) <OVPPetrova@gmail.com>
GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Choroma194@gmail.com>
GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>
GitHub User @tell-k (26263) <ffk2005@gmail.com>

GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <53217283+utkarsh-extc@users.noreply.github.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gnezdo+github@google.com>
Greg Thelen <gthelen@google.com>
Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmes.net>
Guobiao Mei <meiguobiao@gmail.com>
Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>
Han-Wen Nienhuys <hanwen@google.com>
Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>

Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdt@gmail.com>
Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hongfei Tan <feilengcui008@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>
Igor Bernstein <igorbernstein@google.com>

Igor Dolzhikov <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Illya Yalovyy <yalovoy@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>
Ivan Bertona <ivan.bertona@gmail.com>
Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>
Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchii <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>
James David Chalfant <james.chalfant@gmail.com>

James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jlratone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>
James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jameliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>
Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnm@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Culp <jculp14@gmail.com>
Jaroslav Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>
Jason Smale <jsmale@zendesk.com>

Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weisskopf <jay@jayschwa.net>
Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>
Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>
Jimmy Frasche <soapboxcicero@gmail.com>

Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>
Jiulong Wang <jiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>
Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>
Joe Shaw <joe@joeshaw.org>
Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
John Weldon <johnweldon4@gmail.com>

Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jonas Bernoulli <jonas@bernoul.li>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>
Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kiefte <ikojba@gmail.com> <joop@kiefte.net>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jos Visser <josv@google.com>
Jose Luis Vazquez Gonzalez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhauug <js@solidsystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
JT Olio <hello@jtolio.com>

Juan Carlos <juanjcsr@gmail.com>
Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>
Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>
Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kelly Heller <pestophagous@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmiller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katie Hockman <katie@golang.org>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>

Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>
Kirill Smelkov <kirr@nexedi.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitij Saraogi@gmail.com>
Kun Li <likunarmstrong@gmail.com>

Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>
Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Kyrylo Silin <silin@kyrylo.org>
L Campbell <unpantsu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lanm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>
Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>
Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Lion Yang <lion@aosc.xyz>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>
Luca Greco <luca.greco@alcacoop.it>

Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>
Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>
Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>
Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Willock <crazcalm@gmail.com>
Marga Manterola <marga@google.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>
Marius Nuennerich <mnu@google.com>

Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>
Martin Kunc <martinkunc@users.noreply.github.com>
Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>
Mt Gulys <mgulyas86@gmail.com>

Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>
Matt Layher <mdllyher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdin.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>
Maya Rashish <maya@NetBSD.org>

Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszek <mknyszek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>
Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorf.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>
Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufl <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgrber <mteichgraber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <ziutek@inet.pl>

Michal Franc <lam.michal.franc@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>
Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mike Tsao <mike@sowbug.com>
Mike Wiacek <mjwiacek@google.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mostyn Bramley-Moore <mostyn@antipode.se>

Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Nan Deng <monnand@gmail.com>
Nao Yonashiro <owan.orisano@gmail.com>
Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>
Nathan Caza <mastercactapus@gmail.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otterness@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>

Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Kryuchkov <nkryuchkov10@gmail.com>
Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nils Larsgrd <nilsmagnus@gmail.com>
Nir Soffer <nirsof@gmail.com>
Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>
Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogsoft.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryanmoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorpus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>
Pascal Dierich <pascal@pascaldierich.com>
Pascal S. de Kloe <pascal@quies.net>

Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>
Peter Dotchev <dotchev@gmail.com>

Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>
Peter Nguyen <peter@mictis.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>
Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.borgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@hellopiers.pro>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Pontus Leitzler <leitzler@gmail.com>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Varanasi <prashant@prashantv.com>
Pravendra Singh <hackpravj@gmail.com>
Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>

Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quinn Slack <sqs@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>
Ricardo Padilha <ricardospadilha@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saarelmä <rsaarelm@gmail.com>
Rob Earhart <earhart@google.com>
Rob Norman <rob.norman@infinitycloud.com>

Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Obryk <robryk@gmail.com>
Robert Seseek <rseseek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Rodolfo Carvalho <rhcarvalho@gmail.com>
Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Verma <rohanverma2004@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bauge <romain.bauge@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Shchekin <mrqtros@gmail.com>
Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <ruiui@google.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribrdb@google.com>
Ryan Canty <jrcanty@gmail.com>
Ryan Dahl <ry@tinyclouds.org>

Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>
Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Sakeven Jiang <jc5930@sina.cn>
Salmn Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>
Sam Boyer <tech@samboyer.org>
Sam Ding <samding@ca.ibm.com>
Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>
Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediaruna.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>

Sean Harger <sharger@google.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>
Seiji Takahashi <timaki.st@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'Snake' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>
Sergey Semin <gray12511@gmail.com>
Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shaozhen Ding <dsz0111@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <sellott@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zsj950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simon Jefford <simon.jefford@gmail.com>

Simon Rawet <simon@rawet.se>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Spencer Nelson <s@spenczar.com>
Spencer Tung <spencertung@google.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Renatus <srenatus@chef.io>
Stephan Zuercher <zuercher@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimisteve@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littiebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>
Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>
Sunny <me@darkowlzz.space>
Suriyaa Sundararuban <suriyaasundararuban@gmail.com>

Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sylvain Zimmer <sylvain@sylvainzimmer.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>
Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddotx.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>

Thomas Kappler <tkappler@gmail.com>
Thomas Meson <zllak@hycik.org>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>
Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubeii@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>
Timothy Studd <tim@timstudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>
Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Payne <twpayne@gmail.com>
Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>
Tonis Tiigi <tonistiigi@gmail.com>
Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Tormod Erevik Lea <tormodlea@gmail.com>
Toshihiro Shiino <shiino.toshihiro@gmail.com>

Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Oohry <ooohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangjparmar@gmail.com>
Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>
Viacheslav Poturaev <vearutop@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>
Visweswara R <r.visweswara@gmail.com>

Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Vladimir Varankin <nek.narqo@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgriffel@gmail.com>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Warren Fernandes <warren.f.fernandes@gmail.com>
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Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>
Wil Selwood <wselwood@gmail.com>
Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xing Xing <mikespook@gmail.com>
Xu Fei <badgangkiller@gmail.com>

Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherve@gmail.com>
Yann Salan <yannsalaun1@gmail.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yasha Bubnov <girokompass@gmail.com>
Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>
Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <ylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>
Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>
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Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
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Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
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Yuval Pavel Zholkover <paulzhol@gmail.com>
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Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>
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Zheng Dayu <davidzheng23@gmail.com>
Zheng Xu <zheng.xu@arm.com>
Zhengyu He <hzy@google.com>
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1.107 netty-resolver 4.1.51.Final

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* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/META-INF/maven/io.netty/netty-resolver/pom.xml

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* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NoopAddressResolverGroup.java

* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/SimpleNameResolver.java

* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NoopAddressResolver.java

* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NameResolver.java

* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/AddressResolverGroup.java

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* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/HostsFileEntries.java

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* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/DefaultNameResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/AbstractAddressResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/HostsFileEntriesResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/InetNameResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/DefaultHostsFileEntriesResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/HostsFileParser.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/InetSocketAddressResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/CompositeNameResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/AddressResolver.java

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jar/io/netty/resolver/RoundRobinInetAddressResolver.java
```

1.108 openjdk-jre 11.0.11u9

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CUP Parser Generator for Java v 0.11b

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include/GL/gl.h :

Mesa 3-D graphics library

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include/GL/glxext.h
include/GL/wglxext.h :

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1.109 kubernetes-apimachinery 1.8.11

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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1.112 xerces-c 3.2.2+debian-1build3

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1.114 bzip2 1.0.8

1.115 cglib 3.3.0

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1.116 dash 0.5.10.2 6

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1.117 pcre 8.39

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Email local part: hzmester

Email domain: freemail.hu

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Written by: Philip Hazel
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1.118 txw2 2.3.3

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bzip2/libbzip2 version 1.0.4 of 20 December 2006

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#####

Constant-time SSSE3 AES core implementation.

version 0.1

##

By Mike Hamburg (Stanford University), 2009

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#####

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## version 0.1
##
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set terminal pngcairo font 'Sans, 8' lw 1 size 1400,1024

set xtics rotate by -45

set style histogram errorbars gap 2 lw 1

set style fill solid border -1

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1.134 aspect-j 1.9.6

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1.135 jline 3.11.0

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1.136 javassist 3.24.0-GA

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```
/*
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 *
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 */
```

Found in path(s):

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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-
jar/javassist/tools/rmi/StubGenerator.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-
jar/javassist/compiler/ast/BinExpr.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-
jar/javassist/compiler/SymbolTable.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-
jar/javassist/bytecode/BadBytecode.java
```

* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/web/Webserver.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/NestMembersAttribute.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/convert/TransformBefore.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/rmi/Proxy.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/SubroutineScanner.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/InstructionPrinter.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/Callback.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/runtime/Inner.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/CtNewWrappedConstructor.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/util/proxy/DefineClassHelper.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/ByteArrayClassPath.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/DuplicateMemberException.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/expr/NewArray.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/CtBehavior.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/ExceptionTable.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/stackmap/MapMaker.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/util/proxy/MethodFilter.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/reflect/CannotCreateException.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/Symbol.java
* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/Frame.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/rmi/AppletServer.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/InstanceOfExpr.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/expr/ExprEditor.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/Analyzer.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/web/Viewer.java
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jar/javassist/CannotCompileException.java
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* /opt/cola/permits/1135880377_1613624050.66/0/javassist-3-24-0-ga-sources-5-
jar/javassist/tools/rmi/ObjectNotFoundException.java
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1.137 libgpg-error 1.37 1

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1.138 urllib3 1.26.5

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Contributions to the urllib3 project

Creator & Maintainer

* Andrey Petrov <andrey.petrov@shazow.net>

Contributors

In chronological order:

- * victor.vde <<http://code.google.com/u/victor.vde/>>
- * HTTPS patch (which inspired HTTPSConnectionPool)

- * erikcederstrand <<http://code.google.com/u/erikcederstrand/>>
- * NTLM-authenticated HTTPSConnectionPool
- * Basic-authenticated HTTPSConnectionPool (merged into make_headers)

- * niphlod <niphlod@gmail.com>
- * Client-verified SSL certificates for HTTPSConnectionPool
- * Response gzip and deflate encoding support
- * Better unicode support for filepost using StringIO buffers

- * btoconnor <brian@btoconnor.net>
- * Non-multipart encoding for POST requests

- * p.dobrogost <<http://code.google.com/u/@WBRSRIBZDhBFXQB6/>>
- * Code review, PEP8 compliance, benchmark fix

- * kennethreitz <me@kennethreitz.com>
- * Bugfixes, suggestions, Requests integration

- * georgemarshall <<https://github.com/georgemarshall>>
- * Bugfixes, Improvements and Test coverage

- * Thomas Kluyver <thomas@kluyver.me.uk>
- * Python 3 support

- * brandon-rhodes <<http://rhodesmill.org/brandon>>
- * Design review, bugfixes, test coverage.

- * studer <theo.studer@gmail.com>

- * IPv6 url support and test coverage

- * Shivaram Lingamneni <slingamn@cs.stanford.edu>
- * Support for explicitly closing pooled connections

- * hartator <hartator@gmail.com>
- * Corrected multipart behavior for params

- * Thomas Weischuh <thomas@t-8ch.de>
- * Support for TLS SNI
- * API unification of ssl_version/cert_reqs
- * SSL fingerprint and alternative hostname verification
- * Bugfixes in testsuite

- * Sune Kirkeby <mig@ibofobi.dk>
- * Optional SNI-support for Python 2 via PyOpenSSL.

- * Marc Schlaich <marc.schlaich@gmail.com>
- * Various bugfixes and test improvements.

- * Bryce Boe <bbzbryce@gmail.com>
- * Correct six.moves conflict
- * Fixed pickle support of some exceptions

- * Boris Figovsky <boris.figovsky@ravellosystems.com>
- * Allowed to skip SSL hostname verification

- * Cory Benfield <<https://lukasa.co.uk/about/>>
- * Stream method for Response objects.
- * Return native strings in header values.
- * Generate 'Host' header when using proxies.

- * Jason Robinson <jaywink@basshero.org>
- * Add missing WrappedSocket.fileno method in PyOpenSSL

- * Audrius Butkevicius <audrius.butkevicius@elastichosts.com>
- * Fixed a race condition

- * Stanislav Vitkovskiy <stas.vitkovsky@gmail.com>
- * Added HTTPS (CONNECT) proxy support

- * Stephen Holsapple <sholsapp@gmail.com>
- * Added abstraction for granular control of request fields

- * Martin von Gagern <Martin.vGagern@gmx.net>
- * Support for non-ASCII header parameters

- * Kevin Burke <kev@inburke.com> and Pavel Kirichenko <juanych@yandex-team.ru>

- * Support for separate connect and request timeouts

- * Peter Waller <p@pwaller.net>
- * `HTTPResponse.tell()` for determining amount received over the wire

- * Nipunn Koorapati <nipunn1313@gmail.com>
- * Ignore default ports when comparing hosts for equality

- * Danilo @dbrgn <<https://dbrgn.ch/>>
- * Disabled TLS compression by default on Python 3.2+
- * Disabled TLS compression in `pyopenssl` contrib module
- * Configurable cipher suites in `pyopenssl` contrib module

- * Roman Bogorodskiy <roman.bogorodskiy@ericsson.com>
- * Account retries on proxy errors

- * Nicolas Delaby <nicolas.delaby@ezeep.com>
- * Use the platform-specific CA certificate locations

- * Josh Schneier <<https://github.com/jschneier>>
- * `HTTPHeaderDict` and associated tests and docs
- * Bugfixes, docs, test coverage

- * Tahia Khan <<http://tahia.tk/>>
- * Added Timeout examples in docs

- * Arthur Grunseid <<https://grunseid.com>>
- * `source_address` support and tests (with <https://github.com/bui>)

- * Ian Cordasco <graffatcolmingov@gmail.com>
- * PEP8 Compliance and Linting
- * Add ability to pass socket options to an HTTP Connection

- * Erik Tollerud <erik.tollerud@gmail.com>
- * Support for standard library `io` module.

- * Krishna Prasad <kprasad.iitd@gmail.com>
- * Google App Engine documentation

- * Aaron Meurer <asmeurer@gmail.com>
- * Added `Url.url`, which unparses a `Url`

- * Evgeny Kapun <abacabadabacaba@gmail.com>
- * Bugfixes

- * Benjamin Meyer <bm_witness@yahoo.com>
- * Security Warning Documentation update for proper capture

- * Shivan Sornarajah <github@sornars.com>
- * Support for using ConnectionPool and PoolManager as context managers.

- * Alex Gaynor <alex.gaynor@gmail.com>
- * Updates to the default SSL configuration

- * Tomas Tomecek <ttomecek@redhat.com>
- * Implemented generator for getting chunks from chunked responses.

- * tlynn <https://github.com/tlynn>
- * Respect the warning preferences at import.

- * David D. Riddle <ddriddle@illinois.edu>
- * IPv6 bugfixes in testsuite

- * Thea Flowers <magicalgirl@google.com>
- * App Engine environment tests.
- * Documentation re-write.

- * John Krauss <https://github.com/talos>
- * Clues to debugging problems with `cryptography` dependency in docs

- * Disassem <https://github.com/Disassem>
- * Fix pool-default headers not applying for url-encoded requests like GET.

- * James Atherfold <jlatherfold@hotmail.com>
- * Bugfixes relating to cleanup of connections during errors.

- * Christian Pedersen <https://github.com/chripede>
- * IPv6 HTTPS proxy bugfix

- * Jordan Moldow <https://github.com/jmoldow>
- * Fix low-level exceptions leaking from ``HTTPResponse.stream()``.
- * Bugfix for ``ConnectionPool.urlopen(release_conn=False)``.
- * Creation of ``HTTPConnectionPool.ResponseCls``.

- * Predrag Gruevski <https://github.com/obi1kenobi>
- * Made cert digest comparison use a constant-time algorithm.

- * Adam Talsma <https://github.com/a-tal>
- * Bugfix to ca_cert file paths.

- * Evan Meagher <https://evanmeagher.net>
- * Bugfix related to `memoryview` usage in PyOpenSSL adapter

- * John Vandenberg <jayvdb@gmail.com>
- * Python 2.6 fixes; pyflakes and pep8 compliance

- * Andy Caldwell <andy.m.caldwell@googlemail.com>
- * Bugfix related to reusing connections in indeterminate states.

- * Ville Skytt <ville.skytta@iki.fi>
- * Logging efficiency improvements, spelling fixes, Travis config.

- * Shige Takeda <smtakeda@gmail.com>
- * Started Recipes documentation and added a recipe about handling concatenated gzip data in HTTP response

- * Jess Shapiro <jesse@jesseshapiro.net>
- * Various character-encoding fixes/tweaks
- * Disabling IPv6 DNS when IPv6 connections not supported

- * David Foster <http://dafoster.net/>
- * Ensure order of request and response headers are preserved.

- * Jeremy Cline <jeremy@jcline.org>
- * Added connection pool keys by scheme

- * Aviv Palivoda <palaviv@gmail.com>
- * History list to Retry object.
- * HTTPResponse contains the last Retry object.

- * Nate Prewitt <nate.prewitt@gmail.com>
- * Ensure timeouts are not booleans and greater than zero.
- * Fixed infinite loop in ``stream`` when amt=None.
- * Added length_remaining to determine remaining data to be read.
- * Added enforce_content_length to raise exception when incorrect content-length received.

- * Seth Michael Larson <sethmichaellarson@protonmail.com>
- * Created selectors backport that supports PEP 475.

- * Alexandre Dias <alex.dias@smarkets.com>
- * Don't retry on timeout if method not in whitelist

- * Moinuddin Quadri <moin18@gmail.com>
- * Lazily load idna package

- * Tom White <s6yg1ez3@mail2tor.com>
- * Made SOCKS handler differentiate socks5h from socks5 and socks4a from socks4.

- * Tim Burke <tim.burke@gmail.com>
- * Stop buffering entire deflate-encoded responses.

- * Tuukka Mustonen <tuukka.mustonen@gmail.com>
- * Add counter for status_forcelist retries.

- * Erik Rose <erik@mozilla.com>

- * Bugfix to pyopenssl vendoring

- * Wolfgang Richter <wolfgang.richter@gmail.com>
- * Bugfix related to loading full certificate chains with PyOpenSSL backend.

- * Mike Miller <github@mikeage.net>
- * Logging improvements to include the HTTP(S) port when opening a new connection

- * Ioannis Tziakos <mail@itziakos.gr>
- * Fix ``util.selectors._fileobj_to_fd`` to accept ``long``.
- * Update appveyor tox setup to use the 64bit python.

- * Akamai (through Jess Shapiro) <jshapiro@akamai.com>
- * Ongoing maintenance; 2017-2018

- * Dominique Leuenberger <dimstar@opensuse.org>
- * Minor fixes in the test suite

- * Will Bond <will@wbond.net>
- * Add Python 2.6 support to ``contrib.securetransport``

- * Aleksei Alekseev <alekseev.yeskela@gmail.com>
- * using auth info for socks proxy

- * Chris Wilcox <git@crwilcox.com>
- * Improve contribution guide
- * Add ``HTTPResponse.geturl`` method to provide ``urllib2.urlopen().geturl()`` behavior

- * Bruce Merry <https://www.brucemerry.org.za>
- * Fix leaking exceptions when system calls are interrupted with zero timeout

- * Hugo van Kemenade <https://github.com/hugovk>
- * Drop support for EOL Python 2.6

- * Tim Bell <https://github.com/timb07>
- * Bugfix for responses with Content-Type: message/* logging warnings

- * Justin Bramley <https://github.com/jbramleycl>
- * Add ability to handle multiple Content-Encodings

- * Katsuhiko YOSHIDA <https://github.com/kyoshidajp>
- * Remove Authorization header regardless of case when redirecting to cross-site

- * James Meickle <https://permadeath.com/>
- * Improve handling of Retry-After header

- * Chris Jerdonek <chris.jerdonek@gmail.com>
- * Remove a spurious TypeError from the exception chain inside

HTTPConnectionPool._make_request(), also for BaseExceptions.

* Jorge Lopez Silva <<https://github.com/jalopezsilva>>

* Added support for forwarding requests through HTTPS proxies.

* Benno Rice <benno@jeamland.net>

* Allow cadata parameter to be passed to underlying ``SSLContext.load_verify_locations()``.

* Keiichi Kobayashi <abok.1k@gmail.com>

* Rename VerifiedHTTPSConnection to HTTPSConnection

* Himanshu Garg <garg_himanshu@outlook.com>

* DOC & LICENSE Update

* Hod Bin Noon <bin.noon.hod@gmail.com>

* Test improvements

* Chris Olufson <tycarac@gmail.com>

* Fix for connection not being released on HTTP redirect and response not preloaded

* [Bastiaan Bakker] <<https://github.com/bastiaanb>>

* Support for logging session keys via environment variable ``SSLKEYLOGFILE`` (Python 3.8+)

* [Ezzeri Esa] <<https://github.com/savarin>>

* Ports and extends on types from typeshed

* [Your name or handle] <[\[email or website\]](#)>

* [Brief summary of your changes]

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1.140 jansi-osx 1.8

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1.143 bzip2 1.0.8 2

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bzip2/libbzip2 version 1.0.8 of 13 July 2019

1.144 tftp-hpa 5.2

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1.148 ipmi-tool 1.8.16

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1.149 curl 7.50.1

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1.150 libatomic-ops 1.2

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1.151 webrtc m44

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modules/audio_coding/codecs/g711/main/source/g711.h
modules/audio_coding/codecs/g722/main/source/g722_decode.c
modules/audio_coding/codecs/g722/main/source/g722_enc_dec.h
modules/audio_coding/codecs/g722/main/source/g722_encode.c
modules/audio_coding/codecs/isac/main/source/fft.c
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modules/audio_device/mac/portaudio/pa_ringbuffer.c

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common_audio/signal_processing/spl_sqrt_floor_arm.S

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/*

* Written by Wilco Dijkstra, 1996. The following email exchange establishes the
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*

* From: Wilco Dijkstra <Wilco.Dijkstra@ntlworld.com>

* Date: Fri, Jun 24, 2011 at 3:20 AM

* Subject: Re: sqrt routine

* To: Kevin Ma <kma@google.com>

* Hi Kevin,

* Thanks for asking. Those routines are public domain (originally posted to
* comp.sys.arm a long time ago), so you can use them freely for any purpose.

* Cheers,

* Wilco

*

* ----- Original Message -----

* From: "Kevin Ma" <kma@google.com>

* To: <Wilco.Dijkstra@ntlworld.com>

* Sent: Thursday, June 23, 2011 11:44 PM

* Subject: Fwd: sqrt routine

* Hi Wilco,

* I saw your sqrt routine from several web sites, including

* <http://www.finesse.demon.co.uk/steven/sqrt.html>.

* Just wonder if there's any copyright information with your Successive

* approximation routines, or if I can freely use it for any purpose.

* Thanks.

* Kevin

*/

Files:

modules/audio_coding/codecs/g711/main/source/g711.c
modules/audio_coding/codecs/g711/main/source/g711.h

License:

/*

* SpanDSP - a series of DSP components for telephony
*
* g711.h - In line A-law and u-law conversion routines
*
* Written by Steve Underwood <steveu@coppice.org>
*
* Copyright (C) 2001 Steve Underwood
*
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*/

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modules/audio_coding/codecs/g722/main/source/g722_decode.c
modules/audio_coding/codecs/g722/main/source/g722_enc_dec.h
modules/audio_coding/codecs/g722/main/source/g722_encode.c

License:

/*
* SpanDSP - a series of DSP components for telephony
*
* g722_decode.c - The ITU G.722 codec, decode part.
*
* Written by Steve Underwood <steveu@coppice.org>
*
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*
* Despite my general liking of the GPL, I place my own contributions
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*
* Based in part on a single channel G.722 codec which is:
*
* Copyright (c) CMU 1993
* Computer Science, Speech Group
* Chengxiang Lu and Alex Hauptmann
*/

Files:

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modules/audio_device/mac/portaudio/pa_ringbuffer.c
modules/audio_device/mac/portaudio/pa_ringbuffer.h

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* \$Id: pa_memorybarrier.h 1240 2007-07-17 13:05:07Z bjornroche \$
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* Memory barrier utilities
*
* Author: Bjorn Roche, XO Audio, LLC
*
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/*
* \$Id: pa_ringbuffer.c 1421 2009-11-18 16:09:05Z bjornroche \$
* Portable Audio I/O Library
* Ring Buffer utility.
*
* Author: Phil Burk, <http://www.softsynth.com>
* modified for SMP safety on Mac OS X by Bjorn Roche
* modified for SMP safety on Linux by Leland Lucius
* also, allowed for const where possible
* modified for multiple-byte-sized data elements by Sven Fischer
*
* Note that this is safe only for a single-thread reader and a
* single-thread writer.
*
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 - * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/HibernateSystemException.java
 - * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/support/SharedEntityManagerBean.java
 - * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/JpaVendorAdapter.java
 - * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/ConfigurableJtaPlatform.java
 - * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/support/OpenEntityManagerInViewFilter.java
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 - * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/persistenceunit/SpringPersistenceUnitInfo.java
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```
/**  
* Create a transactional EntityManager proxy for the given EntityManagerFactory.  
* @param emf the EntityManagerFactory to obtain EntityManagers from as needed  
* @param properties the properties to be passed into the  
* { @code createEntityManager } call (may be { @code null })
```

- * @param entityManagerInterfaces the interfaces to be implemented by the
- * EntityManager. Allows the addition or specification of proprietary interfaces.
- * @return a shareable transactional EntityManager proxy
- */

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1.158 commons-dhcp 1.4

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jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLTable.java

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jar/org/flywaydb/core/internal/configuration/package-info.java

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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/MigrateResult.java

* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/ClassPathScanner.java

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jar/org/flywaydb/core/internal/database/snowflake/SnowflakeParser.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/logging/javautil/JavaUtilLogCreator.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBTable.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/oracle/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/sqlserver/SQLServerConnection.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-

jar/org/flywaydb/core/internal/database/redshift/RedshiftParser.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/resource/StringResource.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/resource/gcs/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/parser/PositionTracker.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/jdbc/PlainExecutionTemplate.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/resolver/CompositeMigrationResolver.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/scanner/classpath/jboss/JBossVFSv2UrlResolver.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/h2/H2Database.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/parser/Statement.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/callback/BaseCallback.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/resolver/ResolvedMigration.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLCopyParsedStatement.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/MigrationType.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/output/CleanResult.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/package-
info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-

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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-

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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-

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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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1.161 ehcache-impl 3.8.1

1.161.1 Available under license :

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Found in path(s):

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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-

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jar/org/ehcache/impl/internal/store/offheap/portability/SerializerPortability.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/loaderwriter/writebehind/StripedWriteBehind.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/heap/holders/CopiedOnHeapValueHolder.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/copy/ReadWriteCopier.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/heap/Backend.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/spi/loaderwriter/DefaultCacheLoaderWriterProviderFactory.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/loaderwriter/writebehind/WriteBehindProviderConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/events/StoreEvents.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/persistence/CacheManagerPersistenceConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/event/package-info.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/offheap/AbstractOffHeapStore.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/events/CacheEventDispatcherFactoryImpl.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/offheap/OffHeapMapStatistics.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/tiering/TieredStoreProviderFactory.java
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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jar/org/ehcache/impl/internal/concurrent/package-info.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/spi/resilience/DefaultResilienceStrategyProvider.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/config/builders/ConfigurationBuilder.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/event/DefaultCacheEventDispatcherConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/loaderwriter/writebehind/NonBatchingLocalHeapWriteBehindQueue.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/AbstractResourcePool.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/tiering/CompoundCachingTier.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/executor/PooledExecutionService.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/sizeof/DefaultSizeOfEngineProviderFactory.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/disk/EhcachePersistentConcurrentOffHeapClockCache.java
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/offheap/OffHeapStore.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/disk/OffHeapDiskStore.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-

jar/org/ehcache/impl/internal/store/loaderwriter/LocalLoaderWriterStore.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/spi/event/DefaultCacheEventListenerProviderFactory.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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jar/org/ehcache/impl/serialization/StringSerializer.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/loaderwriter/writebehind/DefaultBatchingConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/config/builders/CacheConfigurationBuilder.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/events/EventDispatchTask.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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jar/org/ehcache/impl/internal/store/heap/OnHeapStrategy.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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jar/org/ehcache/impl/serialization/IntegerSerializer.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/offheap/OffHeapStoreUtils.java
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jar/org/ehcache/impl/config/store/heap/DefaultSizeOfEngineProviderConfiguration.java
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jar/org/ehcache/impl/internal/events/StoreEventImpl.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/config/builders/CacheManagerConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/store/heap/package-info.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
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jar/org/ehcache/impl/internal/DefaultTimeSourceService.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/config/builders/UserManagedCacheConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/store/disk/OffHeapDiskStoreConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/events/CacheEventDispatcherImpl.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/offheap/OffHeapValueHolder.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/serialization/DoubleSerializer.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/loaderwriter/package-info.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/spi/resilience/DefaultResilienceStrategyProviderFactory.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/util/Pacer.java

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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/reflect/MemberUtils.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/ClassUtils.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/ArrayUtils.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/reflect/MethodUtils.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/reflect/ConstructorUtils.java
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/concurrent/ThreadLocalRandomUtil.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/concurrent/ConcurrentHashMap.java

1.162 commons-fileupload 62

1.162.1 Available under license :

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1.163 sqlite 3.13.0

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1.164 slf4j-log4j 1.7.30

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1.165 spring-beans 5.2.8.RELEASE

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```
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/DefaultsDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/ReaderEventListener.java
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/serviceloader/ServiceFactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/PropertyValuesEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/serviceloader/ServiceLoaderFactoryBean.java
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/annotation/Autowire.java
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```
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/BeanInfoFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/groovy/GroovyDynamicElementReader.groovy
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/propertyeditors/TimeZoneEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/SimpleTypeConverter.java
```


* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/ExtendedBeanInfoFactory.java

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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/BeanDefinitionParser.java

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jar/org/springframework/beans/factory/parsing/ConstructorArgumentEntry.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/DocumentLoader.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/AbstractComponentDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/propertyeditors/LocaleEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/NamespaceHandler.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/support/MutableSortDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/ComponentDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/wiring/BeanWiringInfoResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/PropertyResourceConfigurer.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/EmptyReaderEventListener.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/BeanDefinitionDecorator.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/FactoryBeanNotInitializedException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/PropertyEditorRegistry.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/NullSourceExtractor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/propertyeditors/CharsetEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
```

jar/org/springframework/beans/factory/parsing/ProblemReporter.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/HierarchicalBeanFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/PropertyEntry.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/propertyeditors/InputSourceEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/QualifierEntry.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/annotation/Configurable.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/BeanDefinitionParsingException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/BeanFactoryAware.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/support/SortDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/PassThroughSourceExtractor.java
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jar/org/springframework/beans/factory/support/MethodReplacer.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/XmlBeanDefinitionStoreException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/BeanIsNotAFactoryException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/BeanReference.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/BeanCurrentlyInCreationException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/BeanCreationNotAllowedException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/BeanIsAbstractException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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jar/org/springframework/beans/factory/BeanExpressionException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/ConversionNotSupportedException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/propertyeditors/CurrencyEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/SimplePropertyNamespaceHandler.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-

jar/org/springframework/beans/PropertyEditorRegistrar.java

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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-

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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/InjectionPoint.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/PropertyValue.java
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jar/org/springframework/beans/factory/xml/DelegatingEntityResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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jar/org/springframework/beans/TypeConverterDelegate.java
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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jar/org/springframework/beans/factory/support/BeanDefinitionBuilder.java
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jar/org/springframework/beans/TypeConverterSupport.java
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/CglibSubclassingInstantiationStrategy.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/ConstructorArgumentValues.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-

jar/org/springframework/beans/factory/config/YamlPropertiesFactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/PreferencesPlaceholderConfigurer.java
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jar/org/springframework/beans/support/ArgumentConvertingMethodInvoker.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/BeanDefinitionReaderUtils.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/BeanDefinitionDefaults.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/XmlBeanDefinitionReader.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/PropertiesBeanDefinitionReader.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/ConstructorResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/CachedIntrospectionResults.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/AbstractBeanDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/parsing/ParseState.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/annotation/Lookup.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/DefaultListableBeanFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/annotation/InjectionMetadata.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/SimpleAutowireCandidateResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/BeanFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/YamlProcessor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/ListableBeanFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/AbstractAutowireCapableBeanFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/BeanUtils.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/annotation/Value.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/BeanDefinitionValueResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/DefaultSingletonBeanRegistry.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/AutowireCandidateResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/BeanDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/BeanDefinitionParserDelegate.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-

jar/org/springframework/beans/factory/parsing/ReaderContext.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/FactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/FactoryBeanRegistrySupport.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/DependencyDescriptor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/GenericTypeAwareAutowireCandidateResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/support/AbstractBeanFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/BeanWrapperImpl.java
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jar/org/springframework/beans/propertyeditors/ZoneIdEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/Scope.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/serviceloader/ServiceListFactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/BeanNameAware.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/UtilNamespaceHandler.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/config/SmartInstantiationAwareBeanPostProcessor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/propertyeditors/URLEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-
jar/org/springframework/beans/factory/xml/NamespaceHandlerResolver.java

* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/support/ResourceEditorRegistrar.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/InputStreamEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/SourceExtractor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/NamedBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/ReaderEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/BeanDefinitionCustomizer.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/ImplicitlyAppearedSingletonException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/BeanInitializationException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/FileEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/NullValueInNestedPathException.java
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/SmartInitializingSingleton.java

* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/AbstractSimpleBeanDefinitionParser.java

* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/NotReadablePropertyException.java

* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/annotation/AnnotatedBeanDefinition.java

1.166 lua 5.1.5

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1.168 docker 1.9.1

1.168.1 Available under license :

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1.170 xz 5.2.4 1ubuntu1

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=====

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1.171 jquery 3.5.1

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- * /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/ByteBufAllocator.java
- * /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PooledDirectByteBuf.java
- * /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/SlicedByteBuf.java
- * /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PoolChunkList.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/ByteBufUtil.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/UnpooledByteBufAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/ByteBufInputStream.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/AbstractByteBuf.java
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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/AbstractByteBufAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PoolThreadCache.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PooledByteBufAllocator.java

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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io.netty.buffer/SimpleLeakAwareCompositeByteBuf.java

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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io.netty.buffer/AbstractUnpooledSlicedByteBuf.java

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jar/io/netty/buffer/WrappedCompositeByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
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1.173 poco 1.9.2-3ubuntu3

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Alex Fabijanic
Peter Schojer
Ferdinand Beyer
Krzysztof Burghardt
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1.178 util-linux 2.20.0

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*/

NR START END SECTORS SIZE NAME UUID

1 32 7679 7648 3.7M 8f8378c0-01

2 7680 16383 8704 4.3M 8f8378c0-02

5 7936 12799 4864 2.4M

6 12544 16127 3584 1.8M

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1.179 nio-stream-storage 1.1.3

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1.180 swagger-core 2.1.9

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1.181 ehcache-api 3.8.1

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 */
```

Found in path(s):

```
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/spi/service/ServiceProvider.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/event/package-
info.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/spi/service/Service.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/UserManagedCache.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/package-info.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/expiry/Expirations.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/config/units/EntryUnit.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/config/SizedResourcePool.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/spi/service/ServiceDependencies.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/expiry/Duration.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/event/CacheEvent.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/spi/loaderwriter/BulkCacheLoadingException.java
```

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/Eviction.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/persistence/StateRepository.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheWritingException.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/serialization/package-info.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/ValueSupplier.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/resilience/RecoveryStore.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/copy/package-info.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/serialization/StatefulSerializer.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/Status.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/Configuration.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/WriteBehindConfiguration.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/units/MemoryUnit.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/copy/CopyProvider.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/StateTransitionException.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/expiry/ExpiryPolicy.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/CachePersistenceException.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/PersistentCacheManager.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriterConfiguration.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/event/EventOrdering.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/Builder.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/ResourceType.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/event/EventType.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/serialization/UnsupportedTypeException.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriterProvider.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriter.java

* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-

jar/org/ehcache/spi/copy/Copier.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoadingException.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/serialization/SerializationProvider.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/units/package-info.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/persistence/package-info.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/resilience/package-info.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/persistence/PersistableResourceService.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/event/CacheEventListener.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/service/MaintainableService.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/service/ServiceCreationConfiguration.java
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* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/service/OptionalServiceDependencies.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/PersistentUserManagedCache.java
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* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/FluentCacheConfigurationBuilder.java

1.182 bridgeutils 1.5

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Julian Seward, Cambridge, UK.

jseward@acm.org

bzip2/libbzip2 version 1.0.2 of 30 December 2001

/*

minibz2

libbz2.dll test program.

by Yoshioka Tsuneo (tsuneo@rr.iij4u.or.jp)

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usage: minibz2 [-d] [-{1,2,..9}] [[srcfilename] destfilename]

*/

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1.184 bolt 1.2.1

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1.185 spring-test 5.2.8.RELEASE

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*/
/**
* Kotlin compliant `WebTestClient.BodySpec` for expectations on the response body decoded
* to a single Object, see [KT-5464](https://youtrack.jetbrains.com/issue/KT-5464) for
* more details.
* @since 5.0.6
*/
```

Found in path(s):

```
*/opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/web/reactive/server/WebTestClientExtensions.kt
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```

```
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```
*/opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/web/servlet/htmlunit/MockMvcWebConnection.java
*/opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/web/servlet/MockMvcResultMatchersDsl.kt
*/opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/context/jdbc/SqlScriptsTestExecutionListener.java
*/opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/web/servlet/MockMvcResultHandlersDsl.kt
*/opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/context/event/annotation/PrepareTestInstance.java
*/opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/web/servlet/result/RequestResultMatchers.java
```

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/reactive/server/ExchangeResult.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/result/XpathResultMatchers.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/reactive/server/DefaultWebTestClientBuilder.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/junit4/AbstractTransactionalJUnit4SpringContextTests.java

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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/result/FlashAttributeResultMatchers.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/client/match/MockRestRequestMatchers.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/util/MetaAnnotationUtils.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/reactive/server/WebTestClientConfigurer.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/MockHttpServletRequestDsl.kt

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/annotation/Repeat.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/event/annotation/AfterTestExecution.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/client/match/XpathRequestMatchers.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/reactive/server/DefaultMockServerSpec.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/AbstractGenericContextLoader.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/client/match/JsonPathRequestMatchers.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/result/MockMvcResultHandlers.java

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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/client/MockMvcClientHttpRequestFactory.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/mock/web/MockHttpServletRequestResponse.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/web/AbstractGenericWebContextLoader.java

* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/MockMultipartHttpServletRequestDsl.kt

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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/request/MockMvcRequestBuilders.java
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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/cache/DefaultCacheAwareContextLoaderDelegate.java
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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/result/ModelResultMatchers.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/jdbc/SqlMergeMode.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/TestContextManager.java
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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/TestConstructorUtils.java
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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/mock/jndi/ExpectedLookupTemplate.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/setup/PatternMappingFilterProxy.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/AbstractContextLoader.java
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- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/web/WebDelegatingSmartContextLoader.java
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- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/DelegatingSmartContextLoader.java
- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/setup/MockMvcConfigurerAdapter.java
- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/GenericPropertiesContextLoader.java
- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/DefaultTestContextBootstrapper.java
- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/MergedTestPropertySources.java

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- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/mock/env/MockPropertySource.java

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- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/ActiveProfilesResolver.java
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- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/junit4/SpringRunner.java
- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/mock/web/DelegatingServletOutputStream.java
- * /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/ResultHandler.java
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* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/TestContextBootstrapper.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/junit4/statements/RunAfterTestMethodCallbacks.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/ContextCustomizerFactory.java

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1.188 docker-cli 19.03.5

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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package engine

```
import (  
    "bytes"  
    "encoding/json"  
    "strings"  
    "testing"  
    "time"  
  
    "github.com/docker/cli/cli/command/formatter"  
    "github.com/docker/cli/internal/licenseutils"  
    "github.com/docker/licensing/model"  
    "gotest.tools/assert"  
    is "gotest.tools/assert/cmp"  
)  
  
func TestSubscriptionContextWrite(t *testing.T) {  
    cases := []struct {  
        context formatter.Context  
        expected string  
    }{  
        // Errors  
        {  
            formatter.Context{Format: "{{InvalidFunction}}"},  
            `Template parsing error: template: :1: function "InvalidFunction" not defined`  
        },  
    },  
    {
```

```

formatter.Context{Format: "{{nil}}"},
`Template parsing error: template: :1:2: executing "" at <nil>: nil is not a command
`,
},
// Table format
{
formatter.Context{Format: NewSubscriptionsFormat("table", false)},
`NUM          OWNER          PRODUCT ID    EXPIRES          PRICING COMPONENTS
1            owner1          productid1    2020-01-01 10:00:00 +0000 UTC  compstring
2            owner2          productid2    2020-01-01 10:00:00 +0000 UTC  compstring
`,
},
{
formatter.Context{Format: NewSubscriptionsFormat("table", true)},
`1:License Name: name1 Quantity: 10 nodes Expiration date: 2020-01-01
2:License Name: name2 Quantity: 20 nodes Expiration date: 2020-01-01
`,
},
{
formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", false)},
`OWNER
owner1
owner2
`,
},
{
formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", true)},
`OWNER
owner1
owner2
`,
},
// Raw Format
{
formatter.Context{Format: NewSubscriptionsFormat("raw", false)},
`license: id1
name: name1
owner: owner1
components: compstring

license: id2
name: name2
owner: owner2
components: compstring
`,
},
{

```



```

    formatter.Context{Format: NewSubscriptionsFormat("raw", true)},
    `license: id1
license: id2
`,
},
// Custom Format
{
    formatter.Context{Format: NewSubscriptionsFormat("{{.Owner}}", false)},
    `owner1
owner2
`,
},
}

```

```

expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")

```

```

for _, testcase := range cases {
subscriptions := []licenseutils.LicenseDisplay{
{
    Num: 1,
    Owner: "owner1",
    Subscription: model.Subscription{
        ID: "id1",
        Name: "name1",
        ProductID: "productid1",
        Expires: &expiration,
        PricingComponents: model.PricingComponents{
            &model.SubscriptionPricingComponent{
                Name: "nodes",
                Value: 10,
            },
        },
    },
    ComponentsString: "compstring",
},
{
    Num: 2,
    Owner: "owner2",
    Subscription: model.Subscription{
        ID: "id2",
        Name: "name2",
        ProductID: "productid2",
        Expires: &expiration,
        PricingComponents: model.PricingComponents{
            &model.SubscriptionPricingComponent{
                Name: "nodes",
                Value: 20,
            },
        },
    },
}
}
}

```

```

    },
    },
    ComponentsString: "compstring",
    },
}
out := &bytes.Buffer{}
testcase.context.Output = out
err := SubscriptionsWrite(testcase.context, subscriptions)
if err != nil {
    assert.Error(t, err, testcase.expected)
} else {
    assert.Check(t, is.Equal(testcase.expected, out.String()))
}
}
}

func TestSubscriptionContextWriteJSON(t *testing.T) {
    expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")
    subscriptions := []licenseutils.LicenseDisplay{
        {
            Num: 1,
            Owner: "owner1",
            Subscription: model.Subscription{
                ID: "id1",
                Name: "name1",
                ProductID: "productid1",
                Expires: &expiration,
                PricingComponents: model.PricingComponents{
                    &model.SubscriptionPricingComponent{
                        Name: "nodes",
                        Value: 10,
                    },
                },
            },
            ComponentsString: "compstring",
        },
        {
            Num: 2,
            Owner: "owner2",
            Subscription: model.Subscription{
                ID: "id2",
                Name: "name2",
                ProductID: "productid2",
                Expires: &expiration,
                PricingComponents: model.PricingComponents{
                    &model.SubscriptionPricingComponent{
                        Name: "nodes",
                        Value: 20,
                    },
                },
            },
        },
    }
}

```

```

    },
  },
},
ComponentsString: "compstring",
},
}
expectedJSONs := []map[string]interface{}{
{
  "Owner":      "owner1",
  "ComponentsString": "compstring",
  "Expires":    "2020-01-01T10:00:00Z",
  "DockerID":  "",
  "Eusa":      nil,
  "ID":        "id1",
  "Start":     nil,
  "Name":      "name1",
  "Num":       float64(1),
  "PricingComponents": []interface{}{
    map[string]interface{}{
      "name": "nodes",
      "value": float64(10),
    },
  },
  },
  "ProductID":    "productid1",
  "ProductRatePlan": "",
  "ProductRatePlanID": "",
  "State":        "",
  "Summary":      "License Name: name1\tQuantity: 10 nodes\tExpiration date: 2020-01-01",
},
{
  "Owner":      "owner2",
  "ComponentsString": "compstring",
  "Expires":    "2020-01-01T10:00:00Z",
  "DockerID":  "",
  "Eusa":      nil,
  "ID":        "id2",
  "Start":     nil,
  "Name":      "name2",
  "Num":       float64(2),
  "PricingComponents": []interface{}{
    map[string]interface{}{
      "name": "nodes",
      "value": float64(20),
    },
  },
  },
  "ProductID":    "productid2",
  "ProductRatePlan": "",
  "ProductRatePlanID": "",
}
}

```

```

"State":      "",
"Summary":    "License Name: name2\tQuantity: 20 nodes\tExpiration date: 2020-01-01",
},
}

```

```

out := &bytes.Buffer{ }
err := SubscriptionsWrite(formatter.Context{Format: "{{json .}}", Output: out}, subscriptions)
if err != nil {
t.Fatal(err)
}
for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
var m map[string]interface{ }
if err := json.Unmarshal([]byte(line), &m); err != nil {
t.Fatal(err)
}
assert.Check(t, is.DeepEqual(expectedJSONs[i], m))
}
}

```

```

func TestSubscriptionContextWriteJSONField(t *testing.T) {
subscriptions := []licenseutils.LicenseDisplay{
{Num: 1, Owner: "owner1"},
{Num: 2, Owner: "owner2"},
}
out := &bytes.Buffer{ }
err := SubscriptionsWrite(formatter.Context{Format: "{{json .Owner}}", Output: out}, subscriptions)
if err != nil {
t.Fatal(err)
}
for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
var s string
if err := json.Unmarshal([]byte(line), &s); err != nil {
t.Fatal(err)
}
assert.Check(t, is.Equal(subscriptions[i].Owner, s))
}
}

```

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package licensing

```
import (  
    "context"  
    "crypto/hmac"  
    "crypto/sha256"  
    "encoding/base64"  
    "encoding/json"  
    "fmt"  
    "time"  
  
    "github.com/docker/libtrust"  
    "github.com/docker/licensing/lib/errors"  
    "github.com/docker/licensing/lib/go-clientlib"  
    "github.com/docker/licensing/model"  
)  
  
func (c *client) getLicenseFile(ctx context.Context, subID string) (*model.IssuedLicense, error) {  
    url := c.baseURI  
    url.Path += fmt.Sprintf("/api/billing/v4/subscriptions/%s/license-file", subID)  
  
    license := new(model.IssuedLicense)  
    if _, _, err := c.doReq(ctx, "GET", &url, clientlib.RecvJSON(license)); err != nil {  
        return nil, err  
    }  
  
    return license, nil  
}  
  
// Check verifies that the license identified by the given key id is valid. Note that it does not  
// interrogate the contents of the license.  
func (c *client) check(ctx context.Context, license model.IssuedLicense) (*model.CheckResponse, error) {  
    keyID := license.KeyID  
    privateKey := license.PrivateKey  
  
    authorization, err := c.getAuthorization(ctx, license)  
    if err != nil {  
        return nil, err  
    }  
}
```



```

}

// TODO: Mason - replace this parseJWS with a non libtrust lib
signature, err := libtrust.ParseJWS(authorization)
if err != nil {
    return nil, errors.Wrapf(err, errors.Fields{
        "key_id": keyID,
    }, "license parse JWS failed")
}

keys, err := signature.Verify()
if err != nil {
    return nil, errors.Wrapf(err, errors.Fields{
        "key_id": keyID,
    }, "license signature verification failed")
}

keyCnt := len(keys)
if keyCnt != 1 {
    err = fmt.Errorf("unexpected number of signing keys (%d)", keyCnt)
    return nil, errors.WithStack(err).With(errors.Fields{
        "key_id": keyID,
    })
}

key := keys[0]

if !c.recognizedSigningKey(key) {
    return nil, errors.New("unrecognized signing key")
}

payload, err := signature.Payload()
if err != nil {
    return nil, errors.Wrapf(err, errors.Fields{
        "key_id": keyID,
    }, "malformed signature payload")
}

checkRes := new(model.CheckResponse)

err = json.Unmarshal(payload, &checkRes)
if err != nil {
    return nil, errors.Wrapf(err, errors.Fields{
        "key_id": keyID,
    }, "license payload unmarshal failed")
}

msg := checkRes.Expiration.Format(time.RFC3339)

```

```

if err := checkToken(msg, checkRes.Token, privateKey); err != nil {
    return nil, errors.Wrap(err, errors.Fields{
        "key_id": keyID,
    })
}

return checkRes, nil
}

// recognizedSigningKey returns true if the given key is signed with a recognized signing key, false otherwise
func (c *client) recognizedSigningKey(key libtrust.PublicKey) bool {
    for _, publicKey := range c.publicKeys {
        if key.KeyID() == publicKey.KeyID() {
            return true
        }
    }
    return false
}

// getAuthorization returns the decoded license authorization
func (c *client) getAuthorization(ctx context.Context, license model.IssuedLicense) ([]byte, error) {
    decoded, err := base64.StdEncoding.DecodeString(license.Authorization)
    if err != nil {
        return nil, errors.Wrapf(err, errors.Fields{
            "key_id": license.KeyID,
        }, "decoding license authorization failed")
    }
    return decoded, nil
}

// All of the functions in this file assume that they are receiving a properly
// formatted private key.

// checkToken performs a MAC algorithm (where token is generated by hashing the
// message with the privateKey via GenerateToken) with the purpose of authenticating
// the validity of both the message and the private key of the person who generated
// the token.
func checkToken(message, token, privateKey string) error {
    tokenBytes, err := base64.URLEncoding.DecodeString(token)
    if err != nil {
        return errors.Wrap(err, errors.Fields{"token": token})
    }

    generatedToken, err := generateToken(message, privateKey)
    if err != nil {
        return errors.Wrap(err, errors.Fields{"token": token})
    }
}

```

```

generatedBytes, err := base64.URLEncoding.DecodeString(generatedToken)
if err != nil {
    return errors.Wrap(err, errors.Fields{"token": token})
}

if !hmac.Equal(tokenBytes, generatedBytes) {
    return errors.Forbidden(errors.Fields{"token": token}, "invalid token")
}

return nil
}

// generateToken generates a hash of the message with the privateKey via the
// sha256 algorithm.
func generateToken(message, privateKey string) (string, error) {
    key, err := base64.URLEncoding.DecodeString(privateKey)
    if err != nil {
        return "", errors.Wrap(err, errors.Fields{"msg": message})
    }

    h := hmac.New(sha256.New, key)
    h.Write([]byte(message))
    return base64.URLEncoding.EncodeToString(h.Sum(nil)), nil
}

```

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Prometheus instrumentation library for Go applications

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Go support for Protocol Buffers - Google's data interchange format

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Support for streaming Protocol Buffer messages for the Go language (golang).

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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```
import "time"

// A CheckResponse is the internal content of the PublicCheckResponse signed
// json blob.
type CheckResponse struct {
    Expiration    time.Time `json:"expiration"`
    Token         string    `json:"token"`
    MaxEngines    int      `json:"maxEngines"`
    ScanningEnabled bool     `json:"scanningEnabled"`
    Type          string    `json:"licenseType"`
    Tier          string    `json:"tier"`
}

// IssuedLicense represents an issued license
type IssuedLicense struct {
    KeyID        string `json:"key_id"`
    PrivateKey   string `json:"private_key"`
    Authorization string `json:"authorization"`
}

// Valid returns true if the License is syntactically valid, false otherwise
func (l *IssuedLicense) Valid() (bool, string) {
    if l.KeyID == "" {
        return false, "empty key_id"
    }

    if l.PrivateKey == "" {
        return false, "empty private_key"
    }

    if l.Authorization == "" {
        return false, "empty authorization"
    }
}
```

```
return true, ""  
}  
ISC License
```

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package engine

```
import (  
    "time"  
  
    "github.com/docker/cli/cli/command/formatter"  
    "github.com/docker/cli/internal/licenseutils"  
    "github.com/docker/licensing/model"  
)  
  
const (  
    defaultSubscriptionsTableFormat = "table  
{{.Num}}\t{{.Owner}}\t{{.ProductID}}\t{{.Expires}}\t{{.ComponentsString}}"  
    defaultSubscriptionsQuietFormat = "{{.Num}}:{{.Summary}}"  
  
    numHeader          = "NUM"  
    ownerHeader        = "OWNER"  
    licenseNameHeader  = "NAME"  
    idHeader           = "ID"  
    dockerIDHeader     = "DOCKER ID"  
    productIDHeader    = "PRODUCT ID"  
    productRatePlanHeader = "PRODUCT RATE PLAN"  
    productRatePlanIDHeader = "PRODUCT RATE PLAN ID"  
    startHeader        = "START"  
    expiresHeader      = "EXPIRES"  
    stateHeader        = "STATE"  
    eusaHeader         = "EUSA"  
    pricingComponentsHeader = "PRICING COMPONENTS"  
)  
  
// NewSubscriptionsFormat returns a Format for rendering using a license Context  
func NewSubscriptionsFormat(source string, quiet bool) formatter.Format {  
    switch source {  
    case formatter.TableFormatKey:  
        if quiet {  
            return defaultSubscriptionsQuietFormat  
        }  
        return defaultSubscriptionsTableFormat  
    case formatter.RawFormatKey:  
        if quiet {  
            return `license: {{.ID}}`  
        }  
    }  
}
```

```

return `license: {{.ID}}\nname: {{.Name}}\nowner: {{.Owner}}\ncomponents: {{.ComponentsString}}\n`
}
return formatter.Format(source)
}

// SubscriptionsWrite writes the context
func SubscriptionsWrite(ctx formatter.Context, subs []licenseutils.LicenseDisplay) error {
render := func(format func(subContext formatter.SubContext) error) error {
for _, sub := range subs {
licenseCtx := &licenseContext{trunc: ctx.Trunc, l: sub}
if err := format(licenseCtx); err != nil {
return err
}
}
return nil
}
licenseCtx := licenseContext{}
licenseCtx.Header = map[string]string{
"Num":      numHeader,
"Owner":    ownerHeader,
"Name":     licenseNameHeader,
"ID":      idHeader,
"DockerID": dockerIDHeader,
"ProductID": productIDHeader,
"ProductRatePlan": productRatePlanHeader,
"ProductRatePlanID": productRatePlanIDHeader,
"Start":    startHeader,
"Expires":  expiresHeader,
"State":    stateHeader,
"Eusa":     eusaHeader,
"ComponentsString": pricingComponentsHeader,
}
return ctx.Write(&licenseCtx, render)
}

type licenseContext struct {
formatter.HeaderContext
trunc bool
l licenseutils.LicenseDisplay
}

func (c *licenseContext) MarshalJSON() ([]byte, error) {
return formatter.MarshalJSON(c)
}

func (c *licenseContext) Num() int {
return c.l.Num
}

```



```
func (c *licenseContext) Owner() string {
    return c.l.Owner
}

func (c *licenseContext) ComponentsString() string {
    return c.l.ComponentsString
}

func (c *licenseContext) Summary() string {
    return c.l.String()
}

func (c *licenseContext) Name() string {
    return c.l.Name
}

func (c *licenseContext) ID() string {
    return c.l.ID
}

func (c *licenseContext) DockerID() string {
    return c.l.DockerID
}

func (c *licenseContext) ProductID() string {
    return c.l.ProductID
}

func (c *licenseContext) ProductRatePlan() string {
    return c.l.ProductRatePlan
}

func (c *licenseContext) ProductRatePlanID() string {
    return c.l.ProductRatePlanID
}

func (c *licenseContext) Start() *time.Time {
    return c.l.Start
}

func (c *licenseContext) Expires() *time.Time {
    return c.l.Expires
}

func (c *licenseContext) State() string {
    return c.l.State
}
```

```

func (c *licenseContext) Eusa() *model.EusaState {
    return c.l.Eusa
}

func (c *licenseContext) PricingComponents() []model.SubscriptionPricingComponent {
    // Dereference the pricing component pointers in the pricing components
    // so it can be rendered properly with the template formatter

    var ret []model.SubscriptionPricingComponent
    for _, spc := range c.l.PricingComponents {
        if spc == nil {
            continue
        }
        ret = append(ret, *spc)
    }
    return ret
}

```

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1.189 ethtool 4.6

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1.191 p11-kit 0.23.20-1ubuntu0.1

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1.192 ffmpeg 4.3.1

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Specifically, the GPL parts of FFmpeg are:

- libpostproc
- optional x86 optimization in the files
 - `libavcodec/x86/flac_dsp_gpl.asm`
 - `libavcodec/x86/idct_mmx.c`
 - `libavfilter/x86/vf_removegrain.asm`
- the following building and testing tools
 - `compat/solaris/make_sunver.pl`
 - `doc/t2h.pm`
 - `doc/texi2pod.pl`
 - `libswresample/tests/swresample.c`
 - `tests/checkasm/*`
 - `tests/tiny_ssim.c`
- the following filters in libavfilter:
 - `signature_lookup.c`
 - `vf_blackframe.c`
 - `vf_boxblur.c`
 - `vf_colormatrix.c`
 - `vf_cover_rect.c`
 - `vf_croptdetect.c`
 - `vf_delogo.c`
 - `vf_eq.c`
 - `vf_find_rect.c`
 - `vf_fspp.c`
 - `vf_histeq.c`
 - `vf_hqdn3d.c`
 - `vf_kerndeint.c`

- `vf_lensfun.c` (GPL version 3 or later)
- `vf_mcdeint.c`
- `vf_mpdecimate.c`
- `vf_nnedi.c`
- `vf_owdenoise.c`
- `vf_perspective.c`
- `vf_phase.c`
- `vf_pp.c`
- `vf_pp7.c`
- `vf_pullup.c`
- `vf_repeatfields.c`
- `vf_sab.c`
- `vf_signature.c`
- `vf_smartblur.c`
- `vf_spp.c`
- `vf_stereo3d.c`
- `vf_super2xsai.c`
- `vf_tinterlace.c`
- `vf_uspp.c`
- `vf_vaguedenoiser.c`
- `vsrc_mptestsrc.c`

Should you, for whatever reason, prefer to use version 3 of the (L)GPL, then the configure parameter `--enable-version3` will activate this licensing option for you. Read the file `COPYING.LGPLv3` or, if you have enabled GPL parts, `COPYING.GPLv3` to learn the exact legal terms that apply in this case.

There are a handful of files under other licensing terms, namely:

- * The files `libavcodec/jfdctfst.c`, `libavcodec/jfdctint_template.c` and `libavcodec/jrevdct.c` are taken from libjpeg, see the top of the files for licensing details. Specifically note that you must credit the IJG in the documentation accompanying your program if you only distribute executables. You must also indicate any changes including additions and deletions to those three files in the documentation.
- * `tests/reference.pnm` is under the expat license.

External libraries

FFmpeg can be combined with a number of external libraries, which sometimes affect the licensing of binaries resulting from the combination.

Compatible libraries

The following libraries are under GPL version 2:

- avisynth
- frei0r

- libcdio
- libdavs2
- librubberband
- libvidstab
- libx264
- libx265
- libxavs
- libxavs2
- libxvid

When combining them with FFmpeg, FFmpeg needs to be licensed as GPL as well by passing `--enable-gpl` to configure.

The following libraries are under LGPL version 3:

- gmp
- libaribb24
- liblensfun

When combining them with FFmpeg, use the configure option `--enable-version3` to upgrade FFmpeg to the LGPL v3.

The VMAF, mbedTLS, RK MPI, OpenCORE and VisualOn libraries are under the Apache License 2.0. That license is incompatible with the LGPL v2.1 and the GPL v2, but not with version 3 of those licenses. So to combine these libraries with FFmpeg, the license version needs to be upgraded by passing `--enable-version3` to configure.

The smbclient library is under the GPL v3, to combine it with FFmpeg, the options `--enable-gpl` and `--enable-version3` have to be passed to configure to upgrade FFmpeg to the GPL v3.

Incompatible libraries

There are certain libraries you can combine with FFmpeg whose licenses are not compatible with the GPL and/or the LGPL. If you wish to enable these libraries, even in circumstances that their license may be incompatible, pass `--enable-nonfree` to configure. This will cause the resulting binary to be unredistributable.

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Version 2, June 1991

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1.193 ical4j 3.0.19

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1.194 docker-cli 19.03.6

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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package engine

```
import (  
    "bytes"  
    "encoding/json"  
    "strings"  
    "testing"  
    "time"  
  
    "github.com/docker/cli/cli/command/formatter"  
    "github.com/docker/cli/internal/licenseutils"  
    "github.com/docker/licensing/model"  
    "gotest.tools/assert"  
    is "gotest.tools/assert/cmp"  
)  
  
func TestSubscriptionContextWrite(t *testing.T) {  
    cases := []struct {  
        context formatter.Context  
        expected string  
    } {  
        // Errors  
        {  
            formatter.Context{Format: "{{InvalidFunction}}"},  
            `Template parsing error: template: :1: function "InvalidFunction" not defined`  
        },  
        {  
            formatter.Context{Format: "{{nil}}"},  
            `Template parsing error: template: :1:2: executing "" at <nil>: nil is not a command`  
        },  
        // Table format  
    }
```

```

{
  formatter.Context{Format: NewSubscriptionsFormat("table", false)},
  `NUM          OWNER          PRODUCT ID    EXPIRES          PRICING COMPONENTS
1             owner1          productid1    2020-01-01 10:00:00 +0000 UTC  compstring
2             owner2          productid2    2020-01-01 10:00:00 +0000 UTC  compstring
`,
},
{
  formatter.Context{Format: NewSubscriptionsFormat("table", true)},
  `1:License Name: name1 Quantity: 10 nodes Expiration date: 2020-01-01
2:License Name: name2 Quantity: 20 nodes Expiration date: 2020-01-01
`,
},
{
  formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", false)},
  `OWNER
owner1
owner2
`,
},
{
  formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", true)},
  `OWNER
owner1
owner2
`,
  // Raw Format
  {
    formatter.Context{Format: NewSubscriptionsFormat("raw", false)},
    `license: id1
name: name1
owner: owner1
components: compstring

license: id2
name: name2
owner: owner2
components: compstring
`,
  },
  {
    formatter.Context{Format: NewSubscriptionsFormat("raw", true)},
    `license: id1
license: id2
`,
  },
},

```

```

// Custom Format
{
  formatter.Context{Format: NewSubscriptionsFormat("{{.Owner}}", false)},
  `owner1
owner2
`,
},
}

```

```

expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")

```

```

for _, testcase := range cases {
subscriptions := []licenseutils.LicenseDisplay{
{
  Num: 1,
  Owner: "owner1",
  Subscription: model.Subscription{
    ID: "id1",
    Name: "name1",
    ProductID: "productid1",
    Expires: &expiration,
    PricingComponents: model.PricingComponents{
      &model.SubscriptionPricingComponent{
        Name: "nodes",
        Value: 10,
      },
    },
  },
  ComponentsString: "compstring",
},
{
  Num: 2,
  Owner: "owner2",
  Subscription: model.Subscription{
    ID: "id2",
    Name: "name2",
    ProductID: "productid2",
    Expires: &expiration,
    PricingComponents: model.PricingComponents{
      &model.SubscriptionPricingComponent{
        Name: "nodes",
        Value: 20,
      },
    },
  },
  ComponentsString: "compstring",
},
}
}

```

```

out := &bytes.Buffer{}
testcase.context.Output = out
err := SubscriptionsWrite(testcase.context, subscriptions)
if err != nil {
    assert.Error(t, err, testcase.expected)
} else {
    assert.Check(t, is.Equal(testcase.expected, out.String()))
}
}
}

func TestSubscriptionContextWriteJSON(t *testing.T) {
    expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")
    subscriptions := []licenseutils.LicenseDisplay{
        {
            Num: 1,
            Owner: "owner1",
            Subscription: model.Subscription{
                ID: "id1",
                Name: "name1",
                ProductID: "productid1",
                Expires: &expiration,
                PricingComponents: model.PricingComponents{
                    &model.SubscriptionPricingComponent{
                        Name: "nodes",
                        Value: 10,
                    },
                },
            },
            ComponentsString: "compstring",
        },
        {
            Num: 2,
            Owner: "owner2",
            Subscription: model.Subscription{
                ID: "id2",
                Name: "name2",
                ProductID: "productid2",
                Expires: &expiration,
                PricingComponents: model.PricingComponents{
                    &model.SubscriptionPricingComponent{
                        Name: "nodes",
                        Value: 20,
                    },
                },
            },
            ComponentsString: "compstring",
        },
    },
}
}

```



```

}
expectedJSONs := []map[string]interface{}{
{
  "Owner":      "owner1",
  "ComponentsString": "compstring",
  "Expires":    "2020-01-01T10:00:00Z",
  "DockerID":  "",
  "Eusa":      nil,
  "ID":        "id1",
  "Start":     nil,
  "Name":      "name1",
  "Num":       float64(1),
  "PricingComponents": []interface{}{
    map[string]interface{}{
      "name": "nodes",
      "value": float64(10),
    },
  },
  "ProductID":    "productid1",
  "ProductRatePlan": "",
  "ProductRatePlanID": "",
  "State":        "",
  "Summary":      "License Name: name1\tQuantity: 10 nodes\tExpiration date: 2020-01-01",
},
{
  "Owner":      "owner2",
  "ComponentsString": "compstring",
  "Expires":    "2020-01-01T10:00:00Z",
  "DockerID":  "",
  "Eusa":      nil,
  "ID":        "id2",
  "Start":     nil,
  "Name":      "name2",
  "Num":       float64(2),
  "PricingComponents": []interface{}{
    map[string]interface{}{
      "name": "nodes",
      "value": float64(20),
    },
  },
  "ProductID":    "productid2",
  "ProductRatePlan": "",
  "ProductRatePlanID": "",
  "State":        "",
  "Summary":      "License Name: name2\tQuantity: 20 nodes\tExpiration date: 2020-01-01",
},
}
}

```

```

out := &bytes.Buffer{ }
err := SubscriptionsWrite(formatter.Context{Format: "{{json .}}", Output: out}, subscriptions)
if err != nil {
    t.Fatal(err)
}
for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
    var m map[string]interface{ }
    if err := json.Unmarshal([]byte(line), &m); err != nil {
        t.Fatal(err)
    }
    assert.Check(t, is.DeepEqual(expectedJSONs[i], m))
}
}

func TestSubscriptionContextWriteJSONField(t *testing.T) {
    subscriptions := []licenseutils.LicenseDisplay{
        {Num: 1, Owner: "owner1"},
        {Num: 2, Owner: "owner2"},
    }
    out := &bytes.Buffer{ }
    err := SubscriptionsWrite(formatter.Context{Format: "{{json .Owner}}", Output: out}, subscriptions)
    if err != nil {
        t.Fatal(err)
    }
    for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
        var s string
        if err := json.Unmarshal([]byte(line), &s); err != nil {
            t.Fatal(err)
        }
        assert.Check(t, is.Equal(subscriptions[i].Owner, s))
    }
}

```

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Data model artifacts for Prometheus.

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package licensing

```
import (  
    "context"  
    "crypto/hmac"  
    "crypto/sha256"  
    "encoding/base64"  
    "encoding/json"  
    "fmt"  
    "time"  
  
    "github.com/docker/libtrust"  
    "github.com/docker/licensing/lib/errors"  
    "github.com/docker/licensing/lib/go-clientlib"  
    "github.com/docker/licensing/model"  
)  
  
func (c *client) getLicenseFile(ctx context.Context, subID string) (*model.IssuedLicense, error) {  
    url := c.baseURI  
    url.Path += fmt.Sprintf("/api/billing/v4/subscriptions/%s/license-file", subID)  
  
    license := new(model.IssuedLicense)  
    if _, _, err := c.doReq(ctx, "GET", &url, clientlib.RecvJSON(license)); err != nil {  
        return nil, err  
    }  
  
    return license, nil  
}  
  
// Check verifies that the license identified by the given key id is valid. Note that it does not  
// interrogate the contents of the license.  
func (c *client) check(ctx context.Context, license model.IssuedLicense) (*model.CheckResponse, error) {  
    keyID := license.KeyID  
    privateKey := license.PrivateKey  
  
    authorization, err := c.getAuthorization(ctx, license)  
    if err != nil {  
        return nil, err  
    }  
  
    // TODO: Mason - replace this parseJWS with a non libtrust lib  
    signature, err := libtrust.ParseJWS(authorization)  
    if err != nil {  
        return nil, errors.Wrapf(err, errors.Fields{
```

```

    "key_id": keyID,
  }, "license parse JWS failed")
}

keys, err := signature.Verify()
if err != nil {
  return nil, errors.Wrapf(err, errors.Fields{
    "key_id": keyID,
  }, "license signature verification failed")
}

keyCnt := len(keys)
if keyCnt != 1 {
  err = fmt.Errorf("unexpected number of signing keys (%d)", keyCnt)
  return nil, errors.WithStack(err).With(errors.Fields{
    "key_id": keyID,
  })
}

key := keys[0]

if !c.recognizedSigningKey(key) {
  return nil, errors.New("unrecognized signing key")
}

payload, err := signature.Payload()
if err != nil {
  return nil, errors.Wrapf(err, errors.Fields{
    "key_id": keyID,
  }, "malformed signature payload")
}

checkRes := new(model.CheckResponse)

err = json.Unmarshal(payload, &checkRes)
if err != nil {
  return nil, errors.Wrapf(err, errors.Fields{
    "key_id": keyID,
  }, "license payload unmarshal failed")
}

msg := checkRes.Expiration.Format(time.RFC3339)
if err := checkToken(msg, checkRes.Token, privateKey); err != nil {
  return nil, errors.Wrap(err, errors.Fields{
    "key_id": keyID,
  })
}
}

```

```

return checkRes, nil
}

// recognizedSigningKey returns true if the given key is signed with a recognized signing key, false otherwise
func (c *client) recognizedSigningKey(key libtrust.PublicKey) bool {
for _, publicKey := range c.publicKeys {
if key.KeyID() == publicKey.KeyID() {
return true
}
}
return false
}

// getAuthorization returns the decoded license authorization
func (c *client) getAuthorization(ctx context.Context, license model.IssuedLicense) ([]byte, error) {
decoded, err := base64.StdEncoding.DecodeString(license.Authorization)
if err != nil {
return nil, errors.Wrapf(err, errors.Fields{
"key_id": license.KeyID,
}, "decoding license authorization failed")
}
return decoded, nil
}

// All of the functions in this file assume that they are receiving a properly
// formatted private key.

// checkToken performs a MAC algorithm (where token is generated by hashing the
// message with the privateKey via GenerateToken) with the purpose of authenticating
// the validity of both the message and the private key of the person who generated
// the token.
func checkToken(message, token, privateKey string) error {
tokenBytes, err := base64.URLEncoding.DecodeString(token)
if err != nil {
return errors.Wrap(err, errors.Fields{"token": token})
}

generatedToken, err := generateToken(message, privateKey)
if err != nil {
return errors.Wrap(err, errors.Fields{"token": token})
}

generatedBytes, err := base64.URLEncoding.DecodeString(generatedToken)
if err != nil {
return errors.Wrap(err, errors.Fields{"token": token})
}

if !hmac.Equal(tokenBytes, generatedBytes) {

```



```

return errors.Forbidden(errors.Fields{"token": token}, "invalid token")
}

return nil
}

// generateToken generates a hash of the message with the privateKey via the
// sha256 algorithm.
func generateToken(message, privateKey string) (string, error) {
key, err := base64.URLEncoding.DecodeString(privateKey)
if err != nil {
return "", errors.Wrap(err, errors.Fields{"msg": message})
}

h := hmac.New(sha256.New, key)
h.Write([]byte(message))
return base64.URLEncoding.EncodeToString(h.Sum(nil)), nil
}

```

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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```
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// A CheckResponse is the internal content of the PublicCheckResponse signed
// json blob.
type CheckResponse struct {
    Expiration    time.Time `json:"expiration"`
    Token         string    `json:"token"`
    MaxEngines    int       `json:"maxEngines"`
    ScanningEnabled bool      `json:"scanningEnabled"`
    Type          string    `json:"licenseType"`
    Tier          string    `json:"tier"`
}

// IssuedLicense represents an issued license
type IssuedLicense struct {
    KeyID         string `json:"key_id"`
    PrivateKey    string `json:"private_key"`
    Authorization string `json:"authorization"`
}

// Valid returns true if the License is syntactically valid, false otherwise
func (l *IssuedLicense) Valid() (bool, string) {
    if l.KeyID == "" {
        return false, "empty key_id"
    }

    if l.PrivateKey == "" {
        return false, "empty private_key"
    }

    if l.Authorization == "" {
        return false, "empty authorization"
    }

    return true, ""
}
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package engine

```
import (  
    "time"
```

```
    "github.com/docker/cli/cli/command/formatter"  
    "github.com/docker/cli/internal/licenseutils"  
    "github.com/docker/licensing/model"  
)
```

```
const (  
    defaultSubscriptionsTableFormat = "table"  
    {{{.Num}}}\t{{.Owner}}\t{{.ProductID}}\t{{.Expires}}\t{{.ComponentsString}}}  
    defaultSubscriptionsQuietFormat = "{{.Num}}:{{.Summary}}"
```

```
    numHeader          = "NUM"  
    ownerHeader        = "OWNER"  
    licenseNameHeader  = "NAME"  
    idHeader           = "ID"  
    dockerIDHeader     = "DOCKER ID"  
    productIDHeader    = "PRODUCT ID"  
    productRatePlanHeader = "PRODUCT RATE PLAN"  
    productRatePlanIDHeader = "PRODUCT RATE PLAN ID"  
    startHeader        = "START"  
    expiresHeader       = "EXPIRES"  
    stateHeader         = "STATE"  
    eusaHeader          = "EUSA"  
    pricingComponentsHeader = "PRICING COMPONENTS"  
)
```

// NewSubscriptionsFormat returns a Format for rendering using a license Context

```
func NewSubscriptionsFormat(source string, quiet bool) formatter.Format {  
    switch source {  
    case formatter.TableFormatKey:  
        if quiet {  
            return defaultSubscriptionsQuietFormat  
        }  
        return defaultSubscriptionsTableFormat  
    case formatter.RawFormatKey:  
        if quiet {  
            return `license: {{.ID}}`  
        }  
        return `license: {{.ID}}\nname: {{.Name}}\nowner: {{.Owner}}\ncomponents: {{.ComponentsString}}\n`  
    }  
    return formatter.Format(source)  
}
```

// SubscriptionsWrite writes the context

```

func SubscriptionsWrite(ctx formatter.Context, subs []licenseutils.LicenseDisplay) error {
    render := func(format func(subContext formatter.SubContext) error) error {
        for _, sub := range subs {
            licenseCtx := &licenseContext{trunc: ctx.Trunc, l: sub}
            if err := format(licenseCtx); err != nil {
                return err
            }
        }
        return nil
    }
    licenseCtx := licenseContext{}
    licenseCtx.Header = map[string]string{
        "Num":          numHeader,
        "Owner":        ownerHeader,
        "Name":         licenseNameHeader,
        "ID":           idHeader,
        "DockerID":     dockerIDHeader,
        "ProductID":    productIDHeader,
        "ProductRatePlan": productRatePlanHeader,
        "ProductRatePlanID": productRatePlanIDHeader,
        "Start":        startHeader,
        "Expires":      expiresHeader,
        "State":        stateHeader,
        "Eusa":         eusaHeader,
        "ComponentsString": pricingComponentsHeader,
    }
    return ctx.Write(&licenseCtx, render)
}

type licenseContext struct {
    formatter.HeaderContext
    trunc bool
    l      licenseutils.LicenseDisplay
}

func (c *licenseContext) MarshalJSON() ([]byte, error) {
    return formatter.MarshalJSON(c)
}

func (c *licenseContext) Num() int {
    return c.l.Num
}

func (c *licenseContext) Owner() string {
    return c.l.Owner
}

func (c *licenseContext) ComponentsString() string {

```

```

return c.l.ComponentsString
}

func (c *licenseContext) Summary() string {
return c.l.String()
}

func (c *licenseContext) Name() string {
return c.l.Name
}

func (c *licenseContext) ID() string {
return c.l.ID
}

func (c *licenseContext) DockerID() string {
return c.l.DockerID
}

func (c *licenseContext) ProductID() string {
return c.l.ProductID
}

func (c *licenseContext) ProductRatePlan() string {
return c.l.ProductRatePlan
}

func (c *licenseContext) ProductRatePlanID() string {
return c.l.ProductRatePlanID
}

func (c *licenseContext) Start() *time.Time {
return c.l.Start
}

func (c *licenseContext) Expires() *time.Time {
return c.l.Expires
}

func (c *licenseContext) State() string {
return c.l.State
}

func (c *licenseContext) Eusa() *model.EusaState {
return c.l.Eusa
}

func (c *licenseContext) PricingComponents() []model.SubscriptionPricingComponent {

```

```
// Dereference the pricing component pointers in the pricing components
// so it can be rendered properly with the template formatter
```

```
var ret []model.SubscriptionPricingComponent
for _, spc := range c.l.PricingComponents {
    if spc == nil {
        continue
    }
    ret = append(ret, *spc)
}
return ret
}
```

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1.196 jackson-module-parameter-names

2.11.2

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1.200 zlib 1.2.11.dfsg-2ubuntu1

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```
/* zlib.h -- interface of the 'zlib' general purpose compression library
   version 1.2.11, January 15th, 2017
```

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The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files <http://tools.ietf.org/html/rfc1950> (zlib format), rfc1951 (deflate format) and rfc1952 (gzip format).

*/

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1.201 open-ldap 2.4.58

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1.202 cache-api 1.1.1

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Jason Garrett-Glaser <darkshikari@gmail.com>
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here. Please keep the list sorted by first names.

Ajay Joshi <jaj@google.com>
Balzs Dn <balazs.dan@gmail.com>
Bharat Mediratta <bharat@menalto.com>
Chandler Carruth <chandlerc@google.com>
Chris Prince <cprince@google.com>
Chris Taylor <taylorc@google.com>
Dan Egnor <egnor@google.com>
Eric Roman <eroman@chromium.org>
Hady Zalek <hady.zalek@gmail.com>
Jeffrey Yasskin <jyasskin@google.com>
Ji Sigursson <joi@google.com>
Keir Mierle <mierle@gmail.com>
Keith Ray <keith.ray@gmail.com>
Kenton Varda <kenton@google.com>
Manuel Klimek <klimek@google.com>
Markus Heule <markus.heule@gmail.com>
Mika Raento <mikie@iki.fi>
Mikls Fazekas <mfazekas@szemafor.com>

Pasi Valminen <pasi.valminen@gmail.com>
Patrick Hanna <phanna@google.com>
Patrick Riley <pfr@google.com>
Peter Kaminski <piotr@google.com>
Preston Jackson <preston.a.jackson@gmail.com>
Rainer Klaffenboeck <rainer.klaffenboeck@dynatrace.com>
Russ Cox <rsc@google.com>
Russ Rufer <russ@pentad.com>
Sean Mcafee <eefacm@gmail.com>
Sigurur sgeirsson <siggi@google.com>
Tracy Bialik <tracy@pentad.com>
Vadim Berman <vadimb@google.com>
Vlad Losev <vladl@google.com>
Zhanyong Wan <wan@google.com>

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1.206 zlib 1.2.11

1.206.1 Available under license :

```
/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017
```

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Jean-loup Gailly Mark Adler
jloup@gzip.org madler@alumni.caltech.edu

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1.207 netty-transport 4.1.51.Final

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- * /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/oio/AbstractOioMessageChannel.java
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- * /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalAddress.java
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- * /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/Channel.java
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- * /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/SingleThreadEventLoop.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/PendingBytesTracker.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/DefaultOioDatagramChannelConfig.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DelegatingChannelPromiseNotifier.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/FailedChannel.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelOutputShutdownEvent.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/internal/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/SelectedSelectionKeySetSelector.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioDatagramChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelInputShutdownReadComplete.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/internal/ChannelUtils.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelOutputShutdownException.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelHandlerMask.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ExtendedClosedChannelException.java

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*/
/**
* Handles an I/O event or intercepts an I/O operation, and forwards it to its next handler in
* its { @link ChannelPipeline}.
*
* <h3>Sub-types</h3>
* <p>
* { @link ChannelHandler} itself does not provide many methods, but you usually have to implement one of its
subtypes:
* <ul>
* <li>{ @link ChannelInboundHandler} to handle inbound I/O events, and</li>
* <li>{ @link ChannelOutboundHandler} to handle outbound I/O operations.</li>
* </ul>
* <p>
* <p>
* Alternatively, the following adapter classes are provided for your convenience:
* <ul>
* <li>{ @link ChannelInboundHandlerAdapter} to handle inbound I/O events,</li>
* <li>{ @link ChannelOutboundHandlerAdapter} to handle outbound I/O operations, and</li>
* <li>{ @link ChannelDuplexHandler} to handle both inbound and outbound events</li>
* </ul>
* <p>
* <p>
* For more information, please refer to the documentation of each subtype.
* </p>
*
* <h3>The context object</h3>
* <p>
* A { @link ChannelHandler} is provided with a { @link ChannelHandlerContext}
* object. A { @link ChannelHandler} is supposed to interact with the
* { @link ChannelPipeline} it belongs to via a context object. Using the
* context object, the { @link ChannelHandler} can pass events upstream or
* downstream, modify the pipeline dynamically, or store the information
* (using { @link AttributeKey}s) which is specific to the handler.
*
* <h3>State management</h3>
*
* A { @link ChannelHandler} often needs to store some stateful information.
* The simplest and recommended approach is to use member variables:
* <pre>
* public interface Message {
*     // your methods here
* }

```

```

*
* public class DataServerHandler extends { @link SimpleChannelInboundHandler } &lt;Message> {
*
*     <b>private boolean loggedIn;</b>
*
*     { @code @Override }
*     public void channelRead0({ @link ChannelHandlerContext } ctx, Message message) {
*         if (message instanceof LoginMessage) {
*             authenticate((LoginMessage) message);
*             <b>loggedIn = true;</b>
*         } else (message instanceof GetDataMessage) {
*             if (<b>loggedIn</b>) {
*                 ctx.writeAndFlush(fetchSecret((GetDataMessage) message));
*             } else {
*                 fail();
*             }
*         }
*     }
*     ...
* }
* </pre>

```

* Because the handler instance has a state variable which is dedicated to
 * one connection, you have to create a new handler instance for each new
 * channel to avoid a race condition where a unauthenticated client can get
 * the confidential information:

```

* <pre>
* // Create a new handler instance per channel.
* // See { @link ChannelInitializer#initChannel(Channel) }.
* public class DataServerInitializer extends { @link ChannelInitializer } &lt;{ @link Channel }> {
*     { @code @Override }
*     public void initChannel({ @link Channel } channel) {
*         channel.pipeline().addLast("handler", <b>new DataServerHandler()</b>);
*     }
* }
*
* </pre>

```

* <h4>Using { @link AttributeKey }s</h4>

* Although it's recommended to use member variables to store the state of a
 * handler, for some reason you might not want to create many handler instances.
 * In such a case, you can use { @link AttributeKey }s which is provided by
 * { @link ChannelHandlerContext }:

```

* <pre>
* public interface Message {
*     // your methods here
* }
*

```

```

* { @code @Sharable }
* public class DataServerHandler extends { @link SimpleChannelInboundHandler } &lt; Message &gt; {
*     private final { @link AttributeKey } &lt; { @link Boolean } &gt; auth =
*         { @link AttributeKey#valueOf(String) AttributeKey.valueOf("auth") };
*
*     { @code @Override }
*     public void channelRead({ @link ChannelHandlerContext } ctx, Message message) {
*         { @link Attribute } &lt; { @link Boolean } &gt; attr = ctx.attr(auth);
*         if (message instanceof LoginMessage) {
*             authenticate((LoginMessage) o);
*             <b>attr.set(true)</b>;
*         } else if (message instanceof GetDataMessage) {
*             if (<b>Boolean.TRUE.equals(attr.get())</b>) {
*                 ctx.writeAndFlush(fetchSecret((GetDataMessage) o));
*             } else {
*                 fail();
*             }
*         }
*     }
* }
* ...
* }

```

* Now that the state of the handler is attached to the { @link ChannelHandlerContext }, you can add the same handler instance to different pipelines:

```

* <pre>
* public class DataServerInitializer extends { @link ChannelInitializer } &lt; { @link Channel } &gt; {
*
*     private static final DataServerHandler <b>SHARED</b> = new DataServerHandler();
*
*     { @code @Override }
*     public void initChannel({ @link Channel } channel) {
*         channel.pipeline().addLast("handler", <b>SHARED</b>);
*     }
* }
* </pre>

```

* <h4>The { @code @Sharable } annotation</h4>

* <p>

* In the example above which used an { @link AttributeKey }, you might have noticed the { @code @Sharable } annotation.

* <p>

* If a { @link ChannelHandler } is annotated with the { @code @Sharable } annotation, it means you can create an instance of the handler just once and add it to one or more { @link ChannelPipeline }s multiple times without a race condition.

* <p>

* If this annotation is not specified, you have to create a new handler


```
* instance every time you add it to a pipeline because it has unshared state
* such as member variables.
* <p>
* This annotation is provided for documentation purpose, just like
* <a href="http://www.javaconcurrencyinpractice.com/annotations/doc/">the JCIP annotations</a>.
*
* <h3>Additional resources worth reading</h3>
* <p>
* Please refer to the { @link ChannelHandler }, and
* { @link ChannelPipeline } to find out more about inbound and outbound operations,
* what fundamental differences they have, how they flow in a pipeline, and how to handle
* the operation in your application.
*/
```

Found in path(s):

```
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelHandler.java
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*/
```

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jar/io/netty/channel/socket/nio/NioChannelOption.java
```

```
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/SimpleUserEventChannelHandler.java
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jar/io/netty/channel/DefaultMessageSizeEstimator.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelHandlerAdapter.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/group/DefaultChannelGroup.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/DefaultAddressedEnvelope.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelProgressivePromise.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/group/ChannelGroupException.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelOutboundBuffer.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelId.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/MessageSizeEstimator.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractEventLoopGroup.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelGroup.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelId.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelMatcher.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/DefaultOioSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelMatchers.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ConnectTimeoutException.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/ChannelFactory.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioServerSocketChannelConfig.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelProgressiveFutureListener.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelProgressiveFuture.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/SimpleChannelInboundHandler.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelProgressivePromise.java
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jar/io/netty/channel/ChannelFactory.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/embedded/EmbeddedChannelId.java
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jar/io/netty/channel/AbstractEventLoop.java
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jar/io/netty/channel/pool/SimpleChannelPool.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/pool/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/pool/AbstractChannelPoolHandler.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/DefaultMaxBytesRecvByteBufAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/pool/ChannelPoolMap.java

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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/pool/ChannelPool.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/pool/FixedChannelPool.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/pool/AbstractChannelPoolMap.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/pool/ChannelHealthChecker.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/MaxBytesRecvByteBufAllocator.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/PreferHeapByteBufAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/DuplexChannel.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOutboundInvoker.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/WriteBufferWaterMark.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultSelectStrategyFactory.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/VoidChannelGroupFuture.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/SelectStrategyFactory.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-

jar/io/netty/channel/ChannelInboundInvoker.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/bootstrap/BootstrapConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/bootstrap/ServerBootstrapConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/bootstrap/AbstractBootstrapConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/DefaultSelectStrategy.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/SelectStrategy.java

1.208 tomcat-embed-websocket 9.0.37

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1.209 protobuf 2.4.1

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1.210 hd-parm 9.38

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xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/maven-v4_0_0.xsd">
```

```
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```

```
<artifactId>jctools-core</artifactId>
```

```
<groupId>org.jctools</groupId>
```

```
<version>3.0.0</version>
```

```
<name>Java Concurrency Tools Core Library</name>
```

```
<description>Java Concurrency Tools Core Library</description>
```

```
<packaging>bundle</packaging>
```

```
<dependencies>
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```
<dependency>
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<groupId>org.hamcrest</groupId>
```

```
<artifactId>hamcrest-all</artifactId>
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```
<version>${hamcrest.version}</version>
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```
<scope>test</scope>
```

```
</dependency>
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<dependency>
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<groupId>junit</groupId>
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<artifactId>junit</artifactId>
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```

<version>${junit.version}</version>
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<groupId>com.google.guava</groupId>
<artifactId>guava-testlib</artifactId>
<version>${guava-testlib.version}</version>
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<artifactId>maven-surefire-plugin</artifactId>
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</plugin>
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<groupId>org.apache.felix</groupId>
<artifactId>maven-bundle-plugin</artifactId>
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<configuration>
<instructions>
<Import-Package>sun.misc;resolution:=optional</Import-Package>
</instructions>
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<groupId>org.apache.maven.plugins</groupId>
<artifactId>maven-source-plugin</artifactId>
<version>3.2.0</version>
<executions>
<execution>
<id>attach-sources</id>
<phase>verify</phase>
<goals>
<goal>jar-no-fork</goal>
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</plugin>

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<plugin>
  <groupId>org.apache.maven.plugins</groupId>
  <artifactId>maven-javadoc-plugin</artifactId>
  <version>3.1.1</version>
  <configuration>
    <additionalOptions>
      <additionalOption>-Xdoclint:none</additionalOption>
    </additionalOptions>
    <source>8</source>
  </configuration>
  <executions>
    <execution>
      <id>attach-javadocs</id>
      <goals>
        <goal>jar</goal>
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    </execution>
  </executions>
</plugin>
</plugins>
</build>

<distributionManagement>
  <repository>
    <id>bintray-jctools-jctools</id>
    <name>jctools-jctools</name>
    <url>https://api.bintray.com/maven/jctools/jctools/jctools-core;/publish=1</url>
  </repository>
</distributionManagement>

<url>https://github.com/JCTools</url>
<inceptionYear>2013</inceptionYear>

<licenses>
  <license>
    <name>Apache License, Version 2.0</name>
    <url>http://www.apache.org/licenses/LICENSE-2.0.txt</url>
    <distribution>repo</distribution>
  </license>
</licenses>

<scm>
  <url>https://github.com/JCTools/JCTools</url>
  <connection>scm:git:https://github.com/JCTools/JCTools</connection>
  <tag>HEAD</tag>
</scm>

<developers>

```

```
<developer>
  <url>https://github.com/nitsanw</url>
</developer>
<developer>
  <url>https://github.com/mjpt777</url>
</developer>
<developer>
  <url>https://github.com/RichardWarburton</url>
</developer>
<developer>
  <url>https://github.com/kay</url>
</developer>
<developer>
  <url>https://github.com/franz1981</url>
</developer>
</developers>

<prerequisites>
  <maven>3.5.0</maven>
</prerequisites>

<properties>
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  <java.version>1.6</java.version>
  <java.test.version>1.8</java.test.version>

  <maven.compiler.source>${java.version}</maven.compiler.source>
  <maven.compiler.target>${java.version}</maven.compiler.target>
  <maven.compiler.testSource>${java.test.version}</maven.compiler.testSource>
  <maven.compiler.testTarget>${java.test.version}</maven.compiler.testTarget>

  <hamcrest.version>1.3</hamcrest.version>
  <junit.version>4.12</junit.version>
  <guava-testlib.version>21.0</guava-testlib.version>
</properties>
</project>
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Found in path(s):

* /opt/cola/permits/1177956791_1625584358.42/0/jctools-core-3-0-0-5-jar/META-INF/maven/org.jctools/jctools-core/pom.xml

No license file was found, but licenses were detected in source scan.

Manifest-Version: 1.0

Bnd-LastModified: 1578049665284

Build-Jdk: 1.8.0_232

Built-By: yak

Bundle-Description: Java Concurrency Tools Core Library

Bundle-License: <http://www.apache.org/licenses/LICENSE-2.0.txt>

Bundle-ManifestVersion: 2
Bundle-Name: Java Concurrency Tools Core Library
Bundle-SymbolicName: org.jctools.core
Bundle-Version: 3.0.0
Created-By: Apache Maven Bundle Plugin
Export-Package: org.jctools.maps;version="3.0.0",org.jctools.util;version="3.0.0";uses:="sun.misc",org.jctools.queues;version="3.0.0";uses:="org.jctools.queues.spec",org.jctools.queues.spec;version="3.0.0",org.jctools.queues.atomic;version="3.0.0";uses:="org.jctools.queues,org.jctools.queues.spec"
Import-Package: sun.misc;resolution:=optional
Require-Capability: osgi.ee;filter="(&(osgi.ee=JavaSE)(version=1.6))"
Tool: Bnd-4.2.0.201903051501

Found in path(s):

* /opt/cola/permits/1177956791_1625584358.42/0/jctools-core-3-0-0-5-jar/META-INF/MANIFEST.MF

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1.216 zlib 1.2.11.dfsg-2ubuntu1.2

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```
/* zlib.h -- interface of the 'zlib' general purpose compression library
   version 1.2.11, January 15th, 2017
```

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Jean-loup Gailly Mark Adler
jloup@gzip.org madler@alumni.caltech.edu

The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files <http://tools.ietf.org/html/rfc1950> (zlib format), rfc1951 (deflate format) and rfc1952 (gzip format).

*/

1.217 dmidecode 3.5

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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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jar/io/netty/handler/codec/http/CookieUtil.java
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockEncoder.java

* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyHeadersFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockJZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyStreamStatus.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketProtocolHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeadersFrame.java
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/multipart/FileUploadUtil.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpServerKeepAliveHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketChunkedInput.java

1.219 inotify-tools 3.14

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1.220 acpid 2.0.11

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1.221 flyway-spring5-test 6.4.0

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Found in path(s):

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Found in path(s):

```
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit5/annotation/FlywayTestExtension.java
```

```
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit5/FlywayTestExtension.java
```

```
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit/FlywayTestExecutionListener.java
```

```
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-
```

jar/org/flywaydb/test/ExecutionListenerHelper.java
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit/FlywayHelperFactory.java
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit5/annotation/package-info.java
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* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/context/simple_applicationContext.xml
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/context/flywayContainerContext.xml
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/context/flywaySingleContext.xml
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/context/secondFlywayContainerContext.xml
* /opt/cola/permits/1129909886_1612394261.4/0/flyway-spring5-test-6-4-0-sources-jar/context/flywayPropertiesContext.xml

1.222 libxml 2.9.10+dfsg-5ubuntu0.20.04.1

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1.226 openssl 1.1.1f-1ubuntu2.3

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1.230 openssh 8.0-p1

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* @version 3.0 (December 2000)

*

* Optimised ANSI C code for the Rijndael cipher (now AES)

*

* @author Vincent Rijmen <vincent.rijmen@esat.kuleuven.ac.be>

* @author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>

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1.231 cryptsetup 1.7.2

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That's all there is to it!

From gsf@research.att.com Wed Mar 1 20:30:54 2006

Return-Path: <gsf@research.att.com>

X-Original-To: mps@bridge.intra

Delivered-To: mps@bridge.intra

Received: from localhost (localhost [127.0.0.1])

by localhost (Postfix) with ESMTP id B8C814E4F

for <mps@bridge.intra>; Wed, 1 Mar 2006 20:30:53 +0100 (CET)

Received: from mail.bridge.intra ([127.0.0.1])

by localhost (lnx.bridge.intra [127.0.0.1]) (amavisd-new, port 10024)
with LMTP id 05987-03 for <mps@bridge.intra>;
Wed, 1 Mar 2006 20:30:42 +0100 (CET)
Received: from pop.gmx.net (localhost [127.0.0.1])
by mail.bridge.intra (Postfix) with ESMTP id C8C73794D
for <mps@bridge.intra>; Wed, 1 Mar 2006 20:30:38 +0100 (CET)
X-Flags: 0000
Delivered-To: GMX delivery to ps.m@gmx.net
Received: (qmail invoked by alias); 01 Mar 2006 19:23:46 -0000
Received: from mail-red.research.att.com (EHLO mail-white.research.att.com) [192.20.225.110]
by mx0.gmx.net (mx085) with SMTP; 01 Mar 2006 20:23:46 +0100
Received: from raptor.research.att.com (raptor.research.att.com [135.207.23.32])
by mail-blue.research.att.com (Postfix) with ESMTP id B7929147CBB
for <ps.m@gmx.net>; Wed, 1 Mar 2006 14:23:45 -0500 (EST)
Received: (from gsf@localhost)
by raptor.research.att.com (SGI-8.9.3p2/8.8.7) id OAA86112
for ps.m@gmx.net; Wed, 1 Mar 2006 14:23:45 -0500 (EST)
Date: Wed, 1 Mar 2006 14:23:45 -0500 (EST)
From: Glenn Fowler <gsf@research.att.com>
Message-Id: <200603011923.OAA86112@raptor.research.att.com>
Organization: AT&T Research
X-Mailer: mailx (AT&T/BSD) 9.9 2005-04-21
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
References: <Pine.LNX.4.44.0603012011250.6386-100000@lnx.bridge.intra>
To: mps@bridge.intra
Subject: Re: testregex licensing question
X-GMX-Antivirus: -1 (not scanned, may not use virus scanner)
X-GMX-Antispam: 0 (Mail was not recognized as spam)
X-GMX-UID: lJF3ZO9DeSEkJ2TcbHQhaXN1IGRvb0Ca
X-Virus-Scanned: by amavisd-new at localhost
Status: RO
X-Status:
X-Keywords:
X-UID: 44736

you may include it directly
retain the testregex.c header comment
it uses a very free license to maximize distribution
you can copy that .c comment to any test data files you use
using # comment style to be complete

let me know how it works with your libc
also pass on any new tests you cook up

On Wed, 1 Mar 2006 20:15:02 +0100 (CET) Peter S. Mazinger wrote:

> Hello Glenn!

> I would want to add testregex.c and the related *.dat files to the uClibc
> testsuite. uClibc is licensed under LGPL v2.1. I haven't found any
> licensing related info on testregex.

> Is it allowed to use the code there, or should I accomodate the testsuite
> to download the needed files from the original site each time it is ran?

> Thanks, Peter

> --

> Peter S. Mazinger <ps dot m at gmx dot net> ID: 0xA5F059F2
> Key fingerprint = 92A4 31E1 56BC 3D5A 2D08 BB6E C389 975E A5F0 59F2
Licensed under the LGPL v2.1, see the file COPYING.LIB in this tarball.

1.233 apr-util 1.6.1

1.233.1 Available under license :

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```
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*/

/*

* The apr_md5_encode() routine uses much code obtained from the FreeBSD 3.0

* MD5 crypt() function, which is licenced as follows:

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```
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The initial developer of the original code is Rainer Budde (<http://www.speed-soft.de>).

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1.235 flex 2.5.35

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* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/Settings.java

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* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/DelegatingStatistic.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/notification/ContextualNotification.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/message/ManagementCallMessage.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/call/ContextualCall.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/DefaultCapability.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/StatisticDescriptor.java

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* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/Descriptor.java
* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/context/CapabilityContext.java

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jar/org/springframework/transaction/support/TransactionCallbackWithoutResult.java
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
jar/org/springframework/jca/cci/core/CciOperations.java
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
jar/org/springframework/transaction/event/TransactionPhase.java
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```

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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/event/TransactionalEventListener.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/TransactionManager.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/interceptor/TransactionAttributeSource.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/TransactionExecution.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/reactive/GenericReactiveTransaction.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/annotation/TransactionAnnotationParser.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/interceptor/MethodMapTransactionAttributeSource.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/annotation/JtaTransactionAnnotationParser.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/reactive/TransactionContext.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/reactive/TransactionSynchronizationUtils.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/annotation/AbstractTransactionManagementConfiguration.java  
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/annotation/AnnotationTransactionAttributeSource.java
```

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/TransactionStatus.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/StaticTransactionDefinition.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/reactive/TransactionSynchronization.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/event/ApplicationListenerMethodTransactionalAdapter.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/reactive/TransactionCallback.java

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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/interceptor/CompositeTransactionAttributeSource.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/support/WithoutTransactionOperations.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/TransactionDefinition.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/support/DefaultTransactionStatus.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/reactive/ReactiveResourceSynchronization.java

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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/reactive/TransactionSynchronizationManager.java

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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/interceptor/TransactionAttributeEditor.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/config/JtaTransactionManagerFactoryBean.java

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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/annotation/SpringTransactionAnnotationParser.java

* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/annotation/Ejb3TransactionAnnotationParser.java

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Found in path(s):

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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
jar/org/springframework/jca/cci/CannotCreateRecordException.java
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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
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jar/org/springframework/jca/cci/connection/ConnectionFactoryUtils.java
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
jar/org/springframework/dao/IncorrectResultSizeDataAccessException.java
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
jar/org/springframework/transaction/jta/JtaTransactionObject.java
* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
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jar/org/springframework/transaction/support/TransactionSynchronizationUtils.java

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1.240 libcap 2.22

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1.241 jackson-datatype-jdk8 2.11.2

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- * /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/standard/SpelExpressionParser.java
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- * /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/StandardTypeConverter.java
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- * /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/SpelEvaluationException.java
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* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/ReflectiveMethodExecutor.java
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- * /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/ConstructorExecutor.java
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* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/ExpressionParser.java

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* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/CompiledExpression.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/standard/Token.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/ReflectiveConstructorExecutor.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/AccessException.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/common/ExpressionUtils.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/Expression.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/TypeConverter.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/SpelParseException.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/TypeComparator.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/OperatorOverloader.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/StandardTypeLocator.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/ParseException.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/SpelParserConfiguration.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/ParserContext.java

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Found in path(s):

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/PropertyOrFieldReference.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/OpMinus.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/OperatorNot.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/Elvis.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/CompoundExpression.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/Assign.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/MethodReference.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/FloatLiteral.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/QualifiedIdentifier.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/RealLiteral.java

* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-

jar/org/springframework/expression/spel/ast/OpGE.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/TypeReference.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/OperatorPower.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/OpMultiply.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/Projection.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/OpModulus.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/OpEQ.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/Ternary.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/InlineMap.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/OpInc.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/OpNE.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/PropertyAccessor.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/StringLiteral.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/ReflectiveConstructorResolver.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/OpLE.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/StandardTypeComparator.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
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jar/org/springframework/expression/spel/ast/TypeCode.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-

jar/org/springframework/expression/spel/standard/InternalSpelExpressionParser.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
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jar/org/springframework/expression/spel/ast/Selection.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/SpelNodeImpl.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/ConstructorReference.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/Indexer.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/Operator.java

1.244 zlib 1.2.8

1.244.1 Available under license :

/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017

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1.245 chardet 3.0.4

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1.246 bridgeutils 1.5

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a

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However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

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For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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1.249 kubernetes-api 1.8.11

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990
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1.251 procps 3.2.8

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1.252 libpcap 1.7.4

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1.253 swagger-integration 2.1.9

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Manifest-Version: 1.0

Bundle-Description: swagger-integration

Automatic-Module-Name: io.swagger.v3.oas.integration

Bundle-License: "Apache License 2.0";link="http://www.apache.org/licenses/LICENSE-2.0.html"

package: io.swagger

Bundle-SymbolicName: io.swagger.core.v3.swagger-integration

implementation-version: 2.1.9

Built-By: runner

Bundle-ManifestVersion: 2

Bundle-DocURL: <https://github.com/swagger-api/swagger-core/modules/swagger-integration>
Import-Package: com.fasterxml.jackson.annotation;version="[2.12,3)",com.fasterxml.jackson.databind;version="[2.12,3)",com.fasterxml.jackson.databind.annotation;version="[2.12,3)",io.github.classgraph;version="[4.8,5)",io.swagger.v3.core.converter;version="[2.1,3)",io.swagger.v3.core.jackson;version="[2.1,3)",io.swagger.v3.core.util;version="[2.1,3)",io.swagger.v3.oas.annotations;version="[2.1,3)",io.swagger.v3.oas.integration,io.swagger.v3.oas.integration.api,io.swagger.v3.oas.models;version="[2.1,3)",io.swagger.v3.oas.models.media;version="[2.1,3)",org.apache.commons.lang3;version="[3.7,4)",org.apache.commons.lang3.tuple;version="[3.7,4)",org.slf4j;version="[1.7,2)"
Require-Capability: osgi.ee;filter="(&(osgi.ee=JavaSE)(version=1.8))"
Bundle-Developers: fehguy;email="fehguy@gmail.com";name="Tony Tam",webbron;email="webbron@gmail.com";name="Ron Ratovsky"
url: <https://github.com/swagger-api/swagger-core/modules/swagger-integration>
mode: development
Export-Package: io.swagger.v3.oas.integration;uses:="com.fasterxml.jackson.databind,io.swagger.v3.core.converter,io.swagger.v3.core.util,io.swagger.v3.oas.integration.api,io.swagger.v3.oas.models,org.apache.commons.lang3.tuple,org.slf4j";version="2.1.9",io.swagger.v3.oas.integration.api;uses:="com.fasterxml.jackson.databind,io.swagger.v3.core.converter,io.swagger.v3.oas.integration,io.swagger.v3.oas.models";version="2.1.9"
Bundle-Name: swagger-integration
Bundle-Version: 2.1.9
Bundle-SCM: url="https://github.com/swagger-api/swagger-core/modules/swagger-integration",connection="scm:git:git@github.com:swagger-api/swagger-core.git/modules/swagger-integration",developer-connection="scm:git:git@github.com:swagger-api/swagger-core.git/modules/swagger-integration",tag=HEAD
Created-By: Apache Maven 3.6.3
Build-Jdk: 1.8.0_282

Found in path(s):

* /opt/cola/permits/1165124366_1631831566.71/0/swagger-integration-2-1-9-jar/META-INF/MANIFEST.MF

1.254 Iuxon 1.25.1

1.254.1 Available under license :

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1.255 pxelinux 6.03

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* This file is part of the lwIP TCP/IP stack.

*

* Author: Adam Dunkels <adam@sics.se>

*

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1.256 libjpeg 8d

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This package was created by Mark Mickan <mmickan@debian.org> from sources which can be found at <ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz>

It is partly based on the libjpeg6a package originally put together by Andy Guy <awpguy@acs.ucalgary.ca> and later maintained by Mark Mickan.

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may

distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

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You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

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c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

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1. Source Code.

The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of a work.

A "Standard Interface" means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

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1.262 berkeley-db 5.3.28+dfsg1-0.6ubuntu2

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1.264 docker 19.03.5-r1

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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1.267 jackson-dataformat-yaml 2.11.2

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```
/* From openssl 4.3p2 filename openssl-compat/fake-rfc2553.h */  
/*
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/* from openssl 4.3p2 compat/strlcpy.c */

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/*

* FILE: sha2.c

* AUTHOR: Aaron D. Gifford - <http://www.aarongifford.com/>

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*

* Modified by Jelte Jansen to fit in ldns, and not clash with any
* system-defined SHA code.

* Changes:

* - Renamed (external) functions and constants to fit ldns style

* - Removed _End and _Data functions

* - Added ldns_shaX(data, len, digest) convenience functions

* - Removed prototypes of _Transform functions and made those static

*

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* \$Id: sha2.c,v 1.1 2001/11/08 00:01:51 adg Exp adg \$

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/* From openssh4.3p2 compat/inet_aton.c */

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1.269 spring-security-web 5.3.4.RELEASE

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- */

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- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/logout/LogoutHandler.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/savedrequest/Enumerator.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/UrlUtils.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/DefaultWebInvocationPrivilegeEvaluator.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/savedrequest/FastHttpDateFormat.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/rememberme/TokenBasedRememberMeServices.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/HttpSessionEventPublisher.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/AccessDeniedHandlerImpl.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/savedrequest/SavedRequestAwareWrapper.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/ChannelProcessingFilter.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/RetryWithHttpEntryPoint.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/WebAuthenticationDetails.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/switchuser/SwitchUserFilter.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/PortMapperImpl.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/www/DigestAuthenticationEntryPoint.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/PortResolver.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/RememberMeServices.java
- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/savedrequest/SimpleSavedRequest.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/switchuser/AuthenticationSwitchUserEvent.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/UsernamePasswordAuthenticationFilter.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/WebAuthenticationDetailsSource.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/logout/SecurityContextLogoutHandler.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/intercept/FilterSecurityInterceptor.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/ChannelEntryPoint.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/AbstractAuthenticationProcessingFilter.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/RetryWithHttpsEntryPoint.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/HttpSessionCreatedEvent.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/servletapi/SecurityContextHolderAwareRequestFilter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/HttpSessionDestroyedEvent.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/PortMapper.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/servletapi/SecurityContextHolderAwareRequestWrapper.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/InsecureChannelProcessor.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/switchuser/SwitchUserGrantedAuthority.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/FilterChainProxy.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/FilterInvocation.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/ChannelProcessor.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/logout/LogoutFilter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/rememberme/RememberMeAuthenticationFilter.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/firewall/StrictHttpFirewall.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/DelegatingAuthenticationEntryPoint.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/matcher/ELRequestMatcher.java

* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/matcher/RequestMatcherEditor.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-

jar/org/springframework/security/web/server/authorization/AuthorizationContext.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/authorization/AuthorizationWebFilter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/header/ContentTypeOptionsServerHttpHeadersWriter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/util/matcher/ServerWebExchangeMatcherEntry.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
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jar/org/springframework/security/web/server/authentication/WebFilterChainServerAuthenticationSuccessHandler.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/header/CompositeServerHttpHeadersWriter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/authentication/logout/ServerLogoutSuccessHandler.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/context/NoOpServerSecurityContextRepository.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/jackson2/DefaultCsrfTokenMixin.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/jackson2/DefaultSavedRequestMixin.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/SessionInformationExpiredStrategy.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/jackson2/CookieDeserializer.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/jackson2/SavedCookieMixin.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/jackson2/WebServletJackson2Module.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/jackson2/WebJackson2Module.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/header/writers/ContentSecurityPolicyHeaderWriter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/transport/HttpsRedirectWebFilter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/AbstractAuthenticationTargetUrlRequestHandler.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/ConcurrentSessionFilter.java
* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/AuthenticationFilter.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/intercept/RequestKey.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/www/DigestAuthenticationFilter.java

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- * /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/savedrequest/package-info.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/context/package-info.java
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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/DelegatingAccessDeniedHandler.java

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* /opt/ws_local/PERMITS_SQL/1081949352_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/csrf/CsrfWebFilter.java

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1.272 jul-to-slf4j 1.7.30

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* /opt/cola/permits/1135864176_1613618002.1/0/jul-to-slf4j-1-7-30-sources-1-jar/org/slf4j/bridge/SLF4JBridgeHandler.java

1.273 openssl 1.1.1f-1ubuntu2.3

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```
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/body-
pix.min.js
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pix/dist/util_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/util_test.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/body_pix_test.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/single_person/argmax2d_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/body_pix_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/single_person/argmax2d_test.d.ts

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pix/dist/keypoints.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-

```

pix/dist/multi_person/decode_pose.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/version_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/blur.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/decode_part_map.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi_person/util.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/setup_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/version_test.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi_person/util.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single_person/decode_single_pose.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi_person/build_part_with_score_queue.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/setup_test.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single_person/argmax2d.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single_person/util.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/output_rendering_util.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single_person/util.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single_person/argmax2d.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/output_rendering_util.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi_person/build_part_with_score_queue.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi_person/decode_pose.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/blur.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/keypoints.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/decode_part_map.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/run_tests.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single_person/decode_single_pose.js

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- * /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/saved_models.js
- * /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/index.d.ts
- * /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/resnet.d.ts
- * /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/index.js
- * /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/resnet.js

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{"version":3,"file":"body-
pix.min.js","sources":["../src/decode_part_map.ts","../src/base_model.ts","../src/mobilenet.ts","../src/keypoints.ts","..
/src/multi_person/util.ts","../src/multi_person/decode_multiple_masks_cpu.ts","../src/multi_person/decode_multiple
_masks_webgl.ts","../src/multi_person/decode_instance_masks.ts","../src/multi_person/max_heap.ts","../src/multi_p
erson/build_part_with_score_queue.ts","../src/multi_person/decode_pose.ts","../src/multi_person/decode_multiple_p
oses.ts","../src/resnet.ts","../src/saved_models.ts","../src/util.ts","../src/body_pix_model.ts","../src/output_rendering_
util.ts","../src/blur.ts","../src/part_channels.ts","../src/version.ts"],"sourcesContent":["/**\n * @license\n * Copyright
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=====
\n
*\n\nimport * as tf from '@tensorflow/tfjs-core';\n\n/**\n * Takes the sigmoid of the part heatmap output and
generates a 2d one-hot\n * tensor with ones where the part's score has the maximum value.\n *\n * @param

```

```

partHeatmapScores\n *\nfunction toFlattenedOneHotPartMap(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n
const numParts = partHeatmapScores.shape[2];\n const partMapLocations = tf.argmax(partHeatmapScores, 2);\n\n
const partMapFlattened = tf.reshape(partMapLocations, [-1]);\n\n return tf.oneHot(partMapFlattened, numParts) as
tf.Tensor2D;\n}\n\nfunction clipByMask2d(image: tf.Tensor2D, mask: tf.Tensor2D): tf.Tensor2D {\n return
tf.mul(image, mask);\n}\n\n/**\n * Takes the sigmoid of the segmentation output, and generates a segmentation\n *
mask with a 1 or 0 at each pixel where there is a person or not a person. The\n * segmentation threshold determines
the threshold of a score for a pixel for it\n * to be considered part of a person.\n * @param segmentScores A 3d-
tensor of the sigmoid of the segmentation output.\n * @param segmentationThreshold The minimum that
segmentation values must have\n * to be considered part of the person. Affects the generation of the\n *
segmentation mask and the clipping of the colored part image.\n * @returns A segmentation mask with a 1 or 0
at each pixel where there is a\n * person or not a person.\n */\nexport function toMaskTensor(\n segmentScores:
tf.Tensor2D, threshold: number): tf.Tensor2D {\n return tf.tidy(\n () =>\n (tf.cast(tf.greater(\n
segmentScores, tf.scalar(threshold)), 'int32') as tf.Tensor2D));\n}\n\n/**\n * Takes the sigmoid of the person and
part map output, and returns a 2d tensor\n * of an image with the corresponding value at each pixel corresponding to
the\n * part with the highest value. These part ids are clipped by the segmentation\n * mask. Wherever the a pixel is
clipped by the segmentation mask, its value\n * will set to -1, indicating that there is no part in that pixel.\n *
@param segmentScores A 3d-tensor of the sigmoid of the segmentation output.\n * @param partHeatmapScores A
3d-tensor of the sigmoid of the part heatmap\n * output. The third dimension corresponds to the part.\n * @returns
A 2d tensor of an image with the corresponding value at each pixel\n * corresponding to the part with the
highest value. These part ids are clipped\n * by the segmentation mask. It will have values of -1 for pixels that are\n
* outside of the body and do not have a corresponding part.\n */\nexport function decodePartSegmentation(\n
segmentationMask: tf.Tensor2D,\n partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n const [partMapHeight,\n
partMapWidth, numParts] = partHeatmapScores.shape;\n return tf.tidy(() => {\n const flattenedMap =
toFlattenedOneHotPartMap(partHeatmapScores);\n const partNumbers = tf.expandDims(tf.range(0, numParts, 1,\n
'int32'), 1);\n\n const partMapFlattened =\n tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D),\n
'int32');\n\n const partMap = tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);\n\n const
partMapShiftedUpForClipping = tf.add(partMap, tf.scalar(1, 'int32'));\n\n return tf.sub(clipByMask2d(\n
partMapShiftedUpForClipping as tf.Tensor2D, segmentationMask)\n , tf.scalar(1, 'int32'));\n });\n}\n\nexport
function decodeOnlyPartSegmentation(partHeatmapScores: tf.Tensor3D):\n tf.Tensor2D {\n const
[partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;\n return tf.tidy(() => {\n const
flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);\n const partNumbers =
tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);\n\n const partMapFlattened =\n
tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');\n\n return tf.reshape(partMapFlattened,\n
[partMapHeight, partMapWidth]);\n });\n}\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All Rights
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */\n\n
=====\n
*/\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\nimport
{BodyPixOutputStride} from './types';\n\n/**\n * BodyPix supports using various convolution neural network
models\n * (e.g. ResNet and MobileNetV1) as its underlying base model.\n * The following BaseModel interface
defines a unified interface for\n * creating such BodyPix base models. Currently both MobileNet (in\n *
./mobilenet.ts) and ResNet (in ./resnet.ts) implements the BaseModel\n * interface. New base models that conform
to the BaseModel interface can be\n * added to BodyPix.\n */\nexport abstract class BaseModel {\n constructor(\n
protected readonly model: tfconv.GraphModel,\n public readonly outputStride: BodyPixOutputStride) {\n

```

```

const inputShape =\n      this.model.inputs[0].shape as [number, number, number, number];\n  tf.util.assert(\n    (inputShape[1] === -1) && (inputShape[2] === -1),\n    () => `Input shape [${inputShape[1]}, ${inputShape[2]}}\n  ` +\n    `must both be equal to or -1`);\n  }\n  abstract preprocessInput(input: tf.Tensor3D): tf.Tensor3D;\n  /**\n   * Predicts intermediate Tensor representations.\n   * @param input The input RGB image of the base\n   model.\n   * A Tensor of shape: [ `inputResolution`, `inputResolution`, 3].\n   * @return A dictionary of base\n   model's intermediate predictions.\n   * The returned dictionary should contains the following elements:\n   * -\n   heatmapScores: A Tensor3D that represents the keypoint heatmap scores.\n   * - offsets: A Tensor3D that represents\n   the offsets.\n   * - displacementFwd: A Tensor3D that represents the forward displacement.\n   * -\n   displacementBwd: A Tensor3D that represents the backward displacement.\n   * - segmentation: A Tensor3D that\n   represents the segmentation of all\n   * people.\n   * - longOffsets: A Tensor3D that represents the long offsets used\n   for\n   * instance grouping.\n   * - partHeatmaps: A Tensor3D that represents the body part segmentation.\n   */\n  predict(input: tf.Tensor3D): {\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd:\n    tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n    segmentation: tf.Tensor3D,\n    partHeatmaps: tf.Tensor3D,\n    longOffsets: tf.Tensor3D,\n    partOffsets: tf.Tensor3D\n  } {\n    return tf.tidy(() => {\n      const asFloat =\n        this.preprocessInput(tf.cast(input, 'float32'));\n      const asBatch = tf.expandDims(asFloat, 0);\n      const results =\n        this.model.predict(asBatch) as tf.Tensor4D[];\n      const results3d: tf.Tensor3D[] = results.map(y => tf.squeeze(y,\n        [0]));\n      const namedResults = this.nameOutputResults(results3d);\n      return {\n        heatmapScores:\n        tf.sigmoid(namedResults.heatmap),\n        offsets: namedResults.offsets,\n        displacementFwd:\n        namedResults.displacementFwd,\n        displacementBwd: namedResults.displacementBwd,\n        segmentation:\n        namedResults.segmentation,\n        partHeatmaps: namedResults.partHeatmaps,\n        longOffsets:\n        namedResults.longOffsets,\n        partOffsets: namedResults.partOffsets\n      };}\n    });\n  }\n  // Because\n  MobileNet and ResNet predict() methods output a different order for\n  // these values, we have a method that needs\n  to be implemented to order them.\n  abstract nameOutputResults(results: tf.Tensor3D[]): {\n    heatmap:\n    tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n    segmentation: tf.Tensor3D,\n    partHeatmaps: tf.Tensor3D,\n    longOffsets: tf.Tensor3D,\n    partOffsets:\n    tf.Tensor3D\n  };\n  /**\n   * Releases the CPU and GPU memory allocated by the model.\n   */\n  dispose() {\n    this.model.dispose();\n  }\n  /**\n   * @license\n   * Copyright 2019 Google Inc. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you may not use this file except in\n   compliance with the License.\n   * You may obtain a copy of the License at\n   *  

http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,\n   software\n   * distributed under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES\n   OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language\n   governing permissions and\n   * limitations under the License.\n   */\n  }
}

import * as tf from '@tensorflow/tfjs-core';
import { BaseModel } from './base_model';
export class\n  MobileNet extends BaseModel {\n  preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n    // Normalize the pixels\n    [0, 255] to be between [-1, 1].\n    return tf.tidy(() => tf.sub(tf.div(input, 127.5), 1.0));\n  }\n  nameOutputResults(results: tf.Tensor3D[]) {\n    const [\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets,\n      ] = results;\n    return {\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets\n    };}\n  }
}
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
}

```

```

*\n\nexport type Tuple<T> = [T, T];\nexport type StringTuple = Tuple<string>;\nexport type NumberTuple =
Tuple<number>;\n\nexport const PART_NAMES = [\n 'nose', 'leftEye', 'rightEye', 'leftEar', 'rightEar',
'leftShoulder',\n 'rightShoulder', 'leftElbow', 'rightElbow', 'leftWrist', 'rightWrist',\n 'leftHip', 'rightHip', 'leftKnee',
'rightKnee', 'leftAnkle', 'rightAnkle'\n];\n\nexport const NUM_KEYPOINTS = PART_NAMES.length;\n\nexport
interface NumberDict {\n [jointName: string]: number;\n}\n\nexport const PART_IDS =\nPART_NAMES.reduce((result: NumberDict, jointName, i): NumberDict => {\n  result[jointName] = i;\n
return result;\n }, {});\n\nconst CONNECTED_PART_NAMES: StringTuple[] = [\n ['leftHip', 'leftShoulder'],
['leftElbow', 'leftShoulder'],\n ['leftElbow', 'leftWrist'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['rightHip',
'rightShoulder'],\n ['rightElbow', 'rightShoulder'], ['rightElbow', 'rightWrist'],\n ['rightHip', 'rightKnee'],
['rightKnee', 'rightAnkle'],\n ['leftShoulder', 'rightShoulder'], ['leftHip', 'rightHip']\n];\n\n/*\n * Define the skeleton.
This defines the parent->child relationships of our\n * tree. Arbitrarily this defines the nose as the root of the tree,
however\n * since we will infer the displacement for both parent->child and\n * child->parent, we can define the
tree root as any node.\n */\n\nexport const POSE_CHAIN: StringTuple[] = [\n ['nose', 'leftEye'], ['leftEye', 'leftEar'],
['nose', 'rightEye'],\n ['rightEye', 'rightEar'], ['nose', 'leftShoulder'],\n ['leftShoulder', 'leftElbow'], ['leftElbow',
'leftWrist'],\n ['leftShoulder', 'leftHip'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['nose', 'rightShoulder'],\n
['rightShoulder', 'rightElbow'], ['rightElbow', 'rightWrist'],\n ['rightShoulder', 'rightHip'], ['rightHip', 'rightKnee'],\n
['rightKnee', 'rightAnkle']\n];\n\nexport const CONNECTED_PART_INDICES =
CONNECTED_PART_NAMES.map(\n ([jointNameA, jointNameB]) =>\n ([PART_IDS[jointNameA],
PART_IDS[jointNameB]]);\n), "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Part, TensorBuffer3D, Vector2D} from
'../types';\n\nexport function getScale(\n [height, width]: [number, number],\n [inputResolutionY,
inputResolutionX]: [number, number],\n padding: Padding): [number, number] {\n  const {top: padT, bottom:
padB, left: padL, right: padR} = padding;\n  const scaleY = inputResolutionY / (padT + padB + height);\n  const
scaleX = inputResolutionX / (padL + padR + width);\n  return [scaleX, scaleY];\n}\n\nexport function
getOffsetPoint(\n y: number, x: number, keypoint: number, offsets: TensorBuffer3D): Vector2D {\n  return {\n
y: offsets.get(y, x, keypoint),\n  x: offsets.get(y, x, keypoint + NUM_KEYPOINTS)\n };}\n\nexport function
getImageCoords(\n part: Part, outputStride: number, offsets: TensorBuffer3D): Vector2D {\n  const {heatmapY,
heatmapX, id: keypoint} = part;\n  const {y, x} = getOffsetPoint(heatmapY, heatmapX, keypoint, offsets);\n  return
{\n  x: part.heatmapX * outputStride + x,\n  y: part.heatmapY * outputStride + y\n };}\n\nexport function
fillArray<T>(element: T, size: number): T[] {\n  const result: T[] = new Array(size);\n  for (let i = 0; i < size; i++)
{\n  result[i] = element;\n }\n  return result;\n}\n\nexport function clamp(a: number, min: number, max:
number): number {\n  if (a < min) {\n  return min;\n }\n  if (a > max) {\n  return max;\n }\n  return
a;\n}\n\nexport function squaredDistance(\n y1: number, x1: number, y2: number, x2: number): number {\n  const
dy = y2 - y1;\n  const dx = x2 - x1;\n  return dy * dy + dx * dx;\n}\n\nexport function addVectors(a: Vector2D, b:
Vector2D): Vector2D {\n  return {x: a.x + b.x, y: a.y + b.y};\n}\n\nexport function clampVector(a: Vector2D, min:
number, max: number): Vector2D {\n  return {y: clamp(a.y, min, max), x: clamp(a.x, min, max)};\n}\n\n", "/*\n *
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the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

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the specific language governing permissions and limitations under the License.

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=====
*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\nimport {getScale} from './util';\n\ninterface Pair {\n  x: number;\n  y: number;\n}\n\nfunction computeDistance(embedding: Pair[], pose: Pose, minPartScore = 0.3) {\n  let distance = 0.0;\n  let numKpt = 0;\n  for (let p = 0; p < embedding.length; p++) {\n    if (pose.keypoints[p].score > minPartScore) {\n      numKpt += 1;\n      distance += (embedding[p].x - pose.keypoints[p].position.x) ** 2 +\n        (embedding[p].y - pose.keypoints[p].position.y) ** 2;\n    }\n  }\n  if (numKpt === 0) {\n    distance = Infinity;\n  } else {\n    distance = distance / numKpt;\n  }\n  return distance;\n}\n\nfunction convertToPositionInOutput(\n  position: Pair, [padT, padL]: [number, number],\n  [scaleX, scaleY]: [number, number], stride: number): Pair {\n  const y = Math.round(((padT + position.y + 1.0) * scaleY - 1.0) / stride);\n  const x = Math.round(((padL + position.x + 1.0) * scaleX - 1.0) / stride);\n  return {x, y};\n}\n\nfunction getEmbedding(\n  location: Pair, keypointIndex: number,\n  convertToPosition: (pair: Pair) => Pair, outputResolutionX: number,\n  longOffsets: Float32Array, refineSteps: number, [height, width]: [number, number]): Pair {\n  const newLocation = convertToPosition(location);\n  const nn = newLocation.y * outputResolutionX + newLocation.x;\n  let dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n  let dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n  let y = location.y + dy;\n  let x = location.x + dx;\n  for (let t = 0; t < refineSteps; t++) {\n    y = Math.min(y, height - 1);\n    x = Math.min(x, width - 1);\n    const newPos = convertToPosition({x, y});\n    const nn = newPos.y * outputResolutionX + newPos.x;\n    dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n    dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n    y = y + dy;\n    x = x + dx;\n  }\n  return {x, y};\n}\n\nfunction matchEmbeddingToInstance(\n  location: Pair, longOffsets: Float32Array, poses: Pose[],\n  numKptForMatching: number, [padT, padL]: [number, number],\n  [scaleX, scaleY]: [number, number], outputResolutionX: number,\n  [height, width]: [number, number], stride: number,\n  refineSteps: number): number {\n  const embed: Pair[] = [];\n  const convertToPosition = (pair: Pair) => convertToPositionInOutput(pair, [padT, padL], [scaleX, scaleY], stride);\n  for (let keypointsIndex = 0; keypointsIndex < numKptForMatching; keypointsIndex++) {\n    const embedding = getEmbedding(location, keypointsIndex, convertToPosition, outputResolutionX, longOffsets, refineSteps, [height, width]);\n    embed.push(embedding);\n  }\n  let kMin = -1;\n  let kMinDist = Infinity;\n  for (let k = 0; k < poses.length; k++) {\n    const dist = computeDistance(embed, poses[k]);\n    if (dist < kMinDist) {\n      kMin = k;\n      kMinDist = dist;\n    }\n  }\n  return kMin;\n}\n\nfunction getOutputResolution(\n  [inputResolutionY, inputResolutionX]: [number, number],\n  stride: number): [number, number] {\n  const outputResolutionX = Math.round((inputResolutionX - 1.0) / stride + 1.0);\n  const outputResolutionY = Math.round((inputResolutionY - 1.0) / stride + 1.0);\n  return [outputResolutionX, outputResolutionY];\n}\n\nexport function decodeMultipleMasksCPU(\n  segmentation: Uint8Array, longOffsets: Float32Array,\n  posesAboveScore: Pose[], height: number, width: number, stride: number,\n  [inHeight, inWidth]: [number, number], padding: Padding,\n  refineSteps: number, numKptForMatching = 5): Uint8Array[] {\n  const dataArrays =\n    posesAboveScore.map(x => new Uint8Array(height * width).fill(0));\n  const {top: padT, left: padL} = padding;\n  const [scaleX, scaleY] =\n    getScale([height, width], [inHeight, inWidth], padding);\n  const [outputResolutionX, ] =\n    getOutputResolution([inHeight, inWidth], stride);\n  for (let i = 0; i < height; i += 1) {\n    for (let j = 0; j < width; j += 1) {\n      const n = i * width + j;\n      const prob = segmentation[n];\n      if (prob === 1) {\n        const kMin = matchEmbeddingToInstance({x: j, y: i}, longOffsets, posesAboveScore, numKptForMatching, [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width], stride, refineSteps);\n        if (kMin >= 0) {\n          dataArrays[kMin][n] = 1;\n        }\n      }\n    }\n  }\n  return dataArrays;\n}\n\nexport function decodeMultiplePartMasksCPU(\n  segmentation: Uint8Array, longOffsets: Float32Array,\n  partSegmentaion: Uint8Array, posesAboveScore: Pose[], height: number,\n  width: number, stride: number, [inHeight, inWidth]: [number, number],\n  padding: Padding, refineSteps: number, numKptForMatching = 5): Int32Array[] {\n  const dataArrays =\n    posesAboveScore.map(x => new Int32Array(height * width).fill(-1));\n  const {top: padT, left: padL} = padding;\n  const [scaleX, scaleY] =\n    getScale([height, width], [inHeight, inWidth], padding);\n  const [outputResolutionX, ] =\n
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getOutputResolution([inHeight, inWidth], stride);\n\n for (let i = 0; i < height; i += 1) {\n  for (let j = 0; j < width; j
+= 1) {\n   const n = i * width + j;\n   const prob = segmentation[n];\n   if (prob === 1) {\n    const kMin =
matchEmbeddingToInstance(\n      {x: j, y: i}, longOffsets, posesAboveScore, numKptForMatching,\n [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n      stride, refineSteps);\n    if (kMin >=
0) {\n     dataArrays[kMin][n] = partSegmentaion[n];\n     }\n   }\n }\n }\n\n return
dataArrays;\n}\n", "/*\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport * as tf_webgl from '@tensorflow/tfjs-backend-
webgl';\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\nimport
{getScale} from './util';\n\nexport function decodeMultipleMasksWebGl(\n  segmentation: tf.Tensor2D,\n longOffsets: tf.Tensor3D,\n  posesAboveScore: Pose[], height: number, width: number, stride: number,\n [inHeight, inWidth]: [number, number], padding: Padding,\n  refineSteps: number, minKptScore: number,\n  maxNumPeople: number): tf.TensorInfo {\n  // The height/width of the image/canvas itself.\n  const [origHeight,
origWidth] = segmentation.shape;\n  // The height/width of the output of the model.\n  const [outHeight, outWidth]
= longOffsets.shape.slice(0, 2);\n  const shapedLongOffsets: tf.Tensor4D =\n    tf.reshape(longOffsets,\n [outHeight, outWidth, 2, NUM_KEYPOINTS]);\n  // Make pose tensor of shape [MAX_NUM_PEOPLE,\n NUM_KEYPOINTS, 3] where\n  // the last 3 coordinates correspond to the score, h and w coordinate of that\n  //
keypoint.\n  const poseVals = new Float32Array(maxNumPeople * NUM_KEYPOINTS * 3).fill(0.0);\n  for (let i =
0; i < posesAboveScore.length; i++) {\n    const poseOffset = i * NUM_KEYPOINTS * 3;\n    const pose =
posesAboveScore[i];\n    for (let kp = 0; kp < NUM_KEYPOINTS; kp++) {\n      const keypoint =
pose.keypoints[kp];\n      const offset = poseOffset + kp * 3;\n      poseVals[offset] = keypoint.score;\n
      poseVals[offset + 1] = keypoint.position.y;\n      poseVals[offset + 2] = keypoint.position.x;\n    }\n  }\n  const
[scaleX, scaleY] =\n    getScale([height, width], [inHeight, inWidth], padding);\n  const posesTensor =
tf.tensor(poseVals, [maxNumPeople, NUM_KEYPOINTS, 3]);\n  const {top: padT, left: padL} = padding;\n  const
program: tf_webgl.GPGPUProgram = {\n    variableNames: ['segmentation', 'longOffsets', 'poses'],\n    outputShape: [origHeight, origWidth],\n    userCode: `\n    int convertToPositionInOutput(int pos, int pad, float
scale, int stride) {\n      return round(((float(pos + pad) + 1.0) * scale - 1.0) / float(stride));\n    }\n\n    float
convertToPositionInOutputFloat(\n      int pos, int pad, float scale, int stride) {\n      return ((float(pos + pad) + 1.0)
* scale - 1.0) / float(stride);\n    }\n\n    float dist(float x1, float y1, float x2, float y2) {\n      return pow(x1 - x2, 2.0)
+ pow(y1 - y2, 2.0);\n    }\n\n    float sampleLongOffsets(float h, float w, int d, int k) {\n      float fh = fract(h);\n
float fw = fract(w);\n      int clH = int(ceil(h));\n      int clW = int(ceil(w));\n      int flH = int(floor(h));\n      int flW =
int(floor(w));\n      float o11 = getLongOffsets(flH, flW, d, k);\n      float o12 = getLongOffsets(flH, clW, d, k);\n
float o21 = getLongOffsets(clH, flW, d, k);\n      float o22 = getLongOffsets(clH, clW, d, k);\n      float o1 =
mix(o11, o12, fw);\n      float o2 = mix(o21, o22, fw);\n      return mix(o1, o2, fh);\n    }\n\n    int
findNearestPose(int h, int w) {\n      float prob = getSegmentation(h, w);\n      if (prob < 1.0) {\n        return -1;\n
      }\n      // Done(Tyler): convert from output space h/w to strided space.\n      float stridedH =
convertToPositionInOutputFloat(\n        h, ${padT}, ${scaleY}, ${stride});\n      float stridedW =
convertToPositionInOutputFloat(\n        w, ${padL}, ${scaleX}, ${stride});\n      float minDist = 1000000.0;\n      int iMin = -1;\n      for (int i = 0; i < ${maxNumPeople}; i++) {\n        float curDistSum = 0.0;\n        int numKpt =
0;\n        for (int k = 0; k < ${NUM_KEYPOINTS}; k++) {\n          float dy = sampleLongOffsets(stridedH,\n stridedW, 0, k);\n          float dx = sampleLongOffsets(stridedH, stridedW, 1, k);\n          float y = float(h) + dy;\n
          float x = float(w) + dx;\n          for (int s = 0; s < ${refineSteps}; s++) {\n            int yRounded = round(min(y,

```



```

float(${height - 1.0}));\n        int xRounded = round(min(x, float(${width - 1.0})));;\n\n        float yStrided =
convertToPositionInOutFloat(\n        yRounded, ${padT}, ${scaleY}, ${stride});\n        float xStrided =
convertToPositionInOutFloat(\n        xRounded, ${padL}, ${scaleX}, ${stride});\n\n        float dy =
sampleLongOffsets(yStrided, xStrided, 0, k);\n        float dx = sampleLongOffsets(yStrided, xStrided, 1, k);\n\n        y = y + dy;\n        x = x + dx;\n    }\n\n    float poseScore = getPoses(i, k, 0);\n    float poseY =
getPoses(i, k, 1);\n    float poseX = getPoses(i, k, 2);\n    if (poseScore > ${minKptScore}) {\n
numKpt = numKpt + 1;\n        curDistSum = curDistSum + dist(x, y, poseX, poseY);\n    }\n    }\n    if
(numKpt > 0 && curDistSum / float(numKpt) < minDist) {\n        minDist = curDistSum / float(numKpt);\n
iMin = i;\n    }\n    }\n    return iMin;\n    }\n\n    void main() {\n        ivec2 coords = getOutputCoords();\n
int nearestPose = findNearestPose(coords[0], coords[1]);\n        setOutput(float(nearestPose));\n    }\n    }\n};\n
const webglBackend = tf.backend() as tf_webgl.MathBackendWebGL;\n    return webglBackend.compileAndRun(\n
    program, [segmentation, shapedLongOffsets, posesTensor]);\n"}\n"/**\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport {getBackend} from '@tensorflow/tfjs-core';\nimport
{Padding, PartSegmentation, PersonSegmentation, Pose} from './types';\nimport {decodeMultipleMasksCPU,
decodeMultiplePartMasksCPU} from './decode_multiple_masks_cpu';\nimport {decodeMultipleMasksWebGl} from
 './decode_multiple_masks_webgl';\n\nexport function toPersonKSegmentation(\n    segmentation: tf.Tensor2D, k:
number): tf.Tensor2D {\n    return tf.tidy(\n        () => (tf.cast(tf.equal(\n            segmentation, tf.scalar(k)), 'int32') as
tf.Tensor2D));\n    }\n\nexport function toPersonKPartSegmentation(\n    segmentation: tf.Tensor2D, bodyParts:
tf.Tensor2D, k: number): tf.Tensor2D {\n    return tf.tidy(\n        () => tf.sub(tf.mul(tf.cast(tf.equal(\n
segmentation, tf.scalar(k)), 'int32'), tf.add(bodyParts, 1)), 1));\n    }\n\nfunction isWebGLBackend() {\n    return
getBackend() === 'webgl';\n}\n\nexport async function decodePersonInstanceMasks(\n    segmentation:
tf.Tensor2D, longOffsets: tf.Tensor3D, poses: Pose[],\n    height: number, width: number, stride: number,\n    [inHeight, inWidth]: [number, number], padding: Padding, minPoseScore = 0.2,\n    refineSteps = 8,
minKeypointScore = 0.3,\n    maxNumPeople = 10): Promise<PersonSegmentation[]> {\n    // Filter out poses with
smaller score.\n    const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n\n    let
personSegmentationsData: Uint8Array[];\n\n    if (isWebGLBackend()) {\n        const personSegmentations = tf.tidy(()
=> {\n            const masksTensorInfo = decodeMultipleMasksWebGl(\n                segmentation, longOffsets,
posesAboveScore, height, width, stride,\n                [inHeight, inWidth], padding, refineSteps, minKeypointScore,\n                maxNumPeople);\n            const masksTensor = tf.engine().makeTensorFromDataId(\n                masksTensorInfo.dataId,
masksTensorInfo.shape,\n                masksTensorInfo.dtype) as tf.Tensor2D;\n\n            return posesAboveScore.map(\n
                (_, k) => toPersonKSegmentation(masksTensor, k);\n            );\n\n            personSegmentationsData =\n                (await
Promise.all(personSegmentations.map(mask => mask.data())) as\n                Uint8Array[]);\n\n            personSegmentations.forEach(x => x.dispose());\n        } else {\n            const segmentationsData = await
segmentation.data() as Uint8Array;\n            const longOffsetsData = await longOffsets.data() as Float32Array;\n\n            personSegmentationsData = decodeMultipleMasksCPU(\n                segmentationsData, longOffsetsData,
posesAboveScore, height, width,\n                stride, [inHeight, inWidth], padding, refineSteps);\n        }\n\n        return
personSegmentationsData.map(\n            (data, i) => ({data, pose: posesAboveScore[i], width, height});\n        );\n\n    }\n\n    export
async function decodePersonInstancePartMasks(\n    segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D,\n    partSegmentation: tf.Tensor2D, poses: Pose[], height: number, width: number,\n    stride: number, [inHeight,
inWidth]: [number, number], padding: Padding,\n    minPoseScore = 0.2, refineSteps = 8, minKeypointScore =
0.3,\n    maxNumPeople = 10): Promise<PartSegmentation[]> {\n        const posesAboveScore = poses.filter(pose =>

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pose.score >= minPoseScore);\n\n let partSegmentationsByPersonData: Int32Array[];\n\n if (isWebGLBackend())\n {\n  const partSegmentations = tf.tidy(() => {\n    const masksTensorInfo = decodeMultipleMasksWebGL(\n      segmentation, longOffsets, posesAboveScore, height, width, stride,\n      [inHeight, inWidth], padding,\n      refineSteps, minKeypointScore,\n      maxNumPeople);\n    const masksTensor =\n      tf.engine().makeTensorFromDataId(\n        masksTensorInfo.dataId, masksTensorInfo.shape,\n        masksTensorInfo.dtype) as tf.Tensor2D);\n    return posesAboveScore.map(\n      (_, k) =>{\n        toPersonKPartSegmentation(masksTensor, partSegmentation, k);\n      });\n    partSegmentationsByPersonData =\n      (await Promise.all(partSegmentations.map(x => x.data()))) as\n      Int32Array[];\n    partSegmentations.forEach(x => x.dispose());\n  } else {\n    const segmentationsData = await segmentation.data()\n      as Uint8Array;\n    const longOffsetsData = await longOffsets.data() as Float32Array;\n    const\n      partSegmentaionData = await partSegmentation.data() as Uint8Array;\n    partSegmentationsByPersonData =\n      decodeMultiplePartMasksCPU(\n        segmentationsData, longOffsetsData, partSegmentaionData,\n        posesAboveScore, height, width, stride, [inHeight, inWidth], padding,\n        refineSteps);\n  }\n  return\n    partSegmentationsByPersonData.map(\n      (data, k) => ({pose: posesAboveScore[k], data, height,\n        width}));\n}\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
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=====\n\n*\n\n// algorithm based on Coursera Lecture from Algorithms, Part 1:\n\nhttps://www.coursera.org/learn/algorithms-part1/lecture/ZjoSM/heapsort\n\nfunction half(k: number) {\n  return\n    Math.floor(k / 2);\n}\n\nexport class MaxHeap<T> {\n  private priorityQueue: T[];\n  private numberOfElements:\n    number;\n  private getElementValue: (element: T) => number;\n  constructor(maxSize: number, getElementValue:\n    (element: T) => number) {\n    this.priorityQueue = new Array(maxSize);\n    this.numberOfElements = -1;\n    this.getElementValue = getElementValue;\n  }\n\n  public enqueue(x: T): void {\n    this.priorityQueue[++this.numberOfElements] = x;\n    this.swim(this.numberOfElements);\n  }\n\n  public\n    dequeue(): T {\n    const max = this.priorityQueue[0];\n    this.exchange(0, this.numberOfElements--);\n    this.sink(0);\n    this.priorityQueue[this.numberOfElements + 1] = null;\n    return max;\n  }\n\n  public empty():\n    boolean {\n    return this.numberOfElements === -1;\n  }\n\n  public size(): number {\n    return\n      this.numberOfElements + 1;\n  }\n\n  public all(): T[] {\n    return this.priorityQueue.slice(0, this.numberOfElements\n      + 1);\n  }\n\n  public max(): T {\n    return this.priorityQueue[0];\n  }\n\n  private swim(k: number): void {\n    while\n      (k > 0 && this.less(half(k), k)) {\n      this.exchange(k, half(k));\n      k = half(k);\n    }\n  }\n\n  private sink(k:\n    number): void {\n    while (2 * k <= this.numberOfElements) {\n      let j = 2 * k;\n      if (j < this.numberOfElements\n        && this.less(j, j + 1)) {\n        j++;\n      }\n      if (!this.less(k, j)) {\n        break;\n      }\n      this.exchange(k, j);\n      k = j;\n    }\n  }\n\n  private getValueAt(i: number): number {\n    return\n      this.getElementValue(this.priorityQueue[i]);\n  }\n\n  private less(i: number, j: number): boolean {\n    return\n      this.getValueAt(i) < this.getValueAt(j);\n  }\n\n  private exchange(i: number, j: number): void {\n    const t =\n      this.priorityQueue[i];\n    this.priorityQueue[i] = this.priorityQueue[j];\n    this.priorityQueue[j] = t;\n  }\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
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*\n\nimport {PartWithScore, TensorBuffer3D} from './types';\n\nimport {MaxHeap} from
'/max_heap';\n\nfunction scoreIsMaximumInLocalWindow(\n  keypointId: number, score: number, heatmapY:
number, heatmapX: number,\n  localMaximumRadius: number, scores: TensorBuffer3D): boolean {\n  const
[height, width] = scores.shape;\n\n  let localMaximum = true;\n  const yStart = Math.max(heatmapY -
localMaximumRadius, 0);\n  const yEnd = Math.min(heatmapY + localMaximumRadius + 1, height);\n  for (let
yCurrent = yStart; yCurrent < yEnd; ++yCurrent) {\n    const xStart = Math.max(heatmapX - localMaximumRadius,
0);\n    const xEnd = Math.min(heatmapX + localMaximumRadius + 1, width);\n    for (let xCurrent = xStart;
xCurrent < xEnd; ++xCurrent) {\n      if (scores.get(yCurrent, xCurrent, keypointId) > score) {\n        localMaximum
= false;\n        break;\n      }\n    }\n    if (!localMaximum) {\n      break;\n    }\n  }\n  return
localMaximum;\n}\n\n/**\n * Builds a priority queue with part candidate positions for a specific image in\n * the
batch. For this we find all local maxima in the score maps with score\n * values above a threshold. We create a
single priority queue across all parts.\n */\nexport function buildPartWithScoreQueue(\n  scoreThreshold: number,
localMaximumRadius: number,\n  scores: TensorBuffer3D): MaxHeap<PartWithScore> {\n  const [height, width,
numKeypoints] = scores.shape;\n\n  const queue = new MaxHeap<PartWithScore>(\n    height * width *
numKeypoints, ({score}) => score);\n\n  for (let heatmapY = 0; heatmapY < height; ++heatmapY) {\n    for (let
heatmapX = 0; heatmapX < width; ++heatmapX) {\n      for (let keypointId = 0; keypointId < numKeypoints;
++keypointId) {\n        const score = scores.get(heatmapY, heatmapX, keypointId);\n        // Only consider parts
with score greater or equal to threshold as\n        // root candidates.\n        if (score < scoreThreshold) {\n          continue;\n        }\n        // Only consider keypoints whose score is maximum in a local window.\n        if
(scoreIsMaximumInLocalWindow(\n          keypointId, score, heatmapY, heatmapX, localMaximumRadius,\n          scores)) {\n          queue.enqueue({score, part: {heatmapY, heatmapX, id: keypointId}});\n        }\n      }\n    }\n  }\n  return queue;\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
=====\n
*\n\nimport {NumberTuple, PART_IDS, PART_NAMES, POSE_CHAIN} from './keypoints';\nimport {Keypoint,
PartWithScore, TensorBuffer3D, Vector2D} from './types';\nimport {clamp, getOffsetPoint} from './util';\nimport
{addVectors, getImageCoords} from './util';\n\nconst parentChildrenTuples: NumberTuple[] =
POSE_CHAIN.map(\n  ([parentJoinName, childJoinName]): NumberTuple =>\n  ([PART_IDS[parentJoinName], PART_IDS[childJoinName]]);\n\nconst parentToChildEdges: number[] =\nparentChildrenTuples.map(([, childJointId]) => childJointId);\n\nconst childToParentEdges: number[] =\nparentChildrenTuples.map(([parentJointId, childJointId]) =>\n  parentJointId);\n\nfunction getDisplacement(\n  edgeId: number, point: Vector2D, displacements:
TensorBuffer3D): Vector2D {\n  const numEdges = displacements.shape[2] / 2;\n  return {\n    y:
displacements.get(point.y, point.x, edgeId),\n    x: displacements.get(point.y, point.x, numEdges + edgeId)\n  };\n}\n\nfunction getStridedIndexNearPoint(\n  point: Vector2D, outputStride: number, height: number,\n  width:
number): Vector2D {\n  return {\n    y: clamp(Math.round(point.y / outputStride), 0, height - 1),\n    x:
clamp(Math.round(point.x / outputStride), 0, width - 1)\n  };\n}\n\n/**\n * We get a new keypoint along the
`edgeId` for the pose instance, assuming\n * that the position of the `idSource` part is already known. For this, we\n
* follow the displacement vector from the source to target part (stored in\n * the `i`-t channel of the displacement
tensor). The displaced keypoint\n * vector is refined using the offset vector by `offsetRefineStep` times.\n */\nfunction traverseToTargetKeypoint(\n  edgeId: number, sourceKeypoint: Keypoint, targetKeypointId:
number,\n  scoresBuffer: TensorBuffer3D, offsets: TensorBuffer3D, outputStride: number,\n  displacements:
TensorBuffer3D, offsetRefineStep = 2): Keypoint {\n  const [height, width] = scoresBuffer.shape;\n\n  // Nearest

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neighbor interpolation for the source->target displacements.\n const sourceKeypointIndices =
getStridedIndexNearPoint(\n sourceKeypoint.position, outputStride, height, width);\n\n const displacement =\n getDisplacement(edgeId, sourceKeypointIndices, displacements);\n\n const displacedPoint =
addVectors(sourceKeypoint.position, displacement);\n let targetKeypoint = displacedPoint;\n for (let i = 0; i <
offsetRefineStep; i++) {\n const targetKeypointIndices =\n getStridedIndexNearPoint(targetKeypoint,
outputStride, height, width);\n\n const offsetPoint = getOffsetPoint(\n targetKeypointIndices.y,
targetKeypointIndices.x, targetKeypointId,\n offsets);\n\n targetKeypoint = addVectors(\n {\n x:
targetKeypointIndices.x * outputStride,\n y: targetKeypointIndices.y * outputStride\n },\n {\n x:
offsetPoint.x, y: offsetPoint.y});\n }\n\n const targetKeypointIndices =\n getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);\n const score = scoresBuffer.get(\n
targetKeypointIndices.y, targetKeypointIndices.x, targetKeypointId);\n\n return { position: targetKeypoint, part:
PART_NAMES[targetKeypointId], score};\n}\n\n/**\n * Follows the displacement fields to decode the full pose of
the object\n * instance given the position of a part that acts as root.\n * @return An array of decoded keypoints
and their scores for a single pose\n */\nexport function decodePose(\n root: PartWithScore, scores:
TensorBuffer3D, offsets: TensorBuffer3D,\n outputStride: number, displacementsFwd: TensorBuffer3D,\n displacementsBwd: TensorBuffer3D): Keypoint[] {\n const numParts = scores.shape[2];\n const numEdges =
parentToChildEdges.length;\n\n const instanceKeypoints: Keypoint[] = new Array(numParts);\n // Start a new
detection instance at the position of the root.\n const {part: rootPart, score: rootScore} = root;\n const rootPoint =
getImageCoords(rootPart, outputStride, offsets);\n\n instanceKeypoints[rootPart.id] = {\n score: rootScore,\n
part: PART_NAMES[rootPart.id],\n position: rootPoint\n };\n\n // Decode the part positions upwards in the tree,
following the backward\n // displacements.\n for (let edge = numEdges - 1; edge >= 0; --edge) {\n const
sourceKeypointId = parentToChildEdges[edge];\n const targetKeypointId = childToParentEdges[edge];\n if
(instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n
instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge,
instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride, displacementsBwd);\n
}\n }\n\n // Decode the part positions downwards in the tree, following the forward\n // displacements.\n for (let
edge = 0; edge < numEdges; ++edge) {\n const sourceKeypointId = childToParentEdges[edge];\n const
targetKeypointId = parentToChildEdges[edge];\n if (instanceKeypoints[sourceKeypointId] &&\n
!instanceKeypoints[targetKeypointId]) {\n instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n
edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride,
displacementsFwd);\n }\n }\n\n return instanceKeypoints;\n}\n\n",/**\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */\n\n
=====\n\n
*/\n\nimport { Keypoint, Pose, TensorBuffer3D } from '../types';\nimport { buildPartWithScoreQueue } from
'/build_part_with_score_queue';\nimport { decodePose } from './decode_pose';\nimport { getImageCoords,
squaredDistance } from './util';\n\nfunction withinNmsRadiusOfCorrespondingPoint(\n poses: Pose[],
squaredNmsRadius: number, {x, y}: {x: number, y: number},\n keypointId: number): boolean {\n return
poses.some(({ keypoints }) => {\n const correspondingKeypoint = keypoints[keypointId].position;\n return
squaredDistance(\n y, x, correspondingKeypoint.y, correspondingKeypoint.x) <=\n
squaredNmsRadius;\n });\n}\n\n/* Score the newly proposed object instance without taking into account\n * the
scores of the parts that overlap with any previously detected\n * instance.\n */\nfunction getInstanceScore(\n
existingPoses: Pose[], squaredNmsRadius: number,\n instanceKeypoints: Keypoint[]): number {\n let
notOverlappedKeypointScores = instanceKeypoints.reduce(\n (result, { position, score }, keypointId): number =>

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{\n    if (!withinNmsRadiusOfCorrespondingPoint(\n        existingPoses, squaredNmsRadius, position,
keypointId)) {\n        result += score;\n    }\n    return result;\n }, 0.0);\n\n return
notOverlappedKeypointScores /= instanceKeypoints.length;\n}\n\n// A point (y, x) is considered as root part
candidate if its score is a\n// maximum in a window |y - y'| <= kLocalMaximumRadius, |x - x'| <= \n//
kLocalMaximumRadius.\nconst kLocalMaximumRadius = 1;\n\n/**\n * Detects multiple poses and finds their parts
from part scores and\n * displacement vectors. It returns up to `maxDetections` object instance\n * detections in
decreasing root score order. It works as follows: We first\n * create a priority queue with local part score maxima
above\n * `scoreThreshold`, considering all parts at the same time. Then we\n * iteratively pull the top element of
the queue (in decreasing score order)\n * and treat it as a root candidate for a new object instance. To avoid\n *
duplicate detections, we reject the root candidate if it is within a disk\n * of `nmsRadius` pixels from the
corresponding part of a previously detected\n * instance, which is a form of part-based non-maximum suppression
(NMS). If\n * the root candidate passes the NMS check, we start a new object instance\n * detection, treating the
corresponding part as root and finding the\n * positions of the remaining parts by following the displacement
vectors\n * along the tree-structured part graph. We assign to the newly detected\n * instance a score equal to the
sum of scores of its parts which have not\n * been claimed by a previous instance (i.e., those at least `nmsRadius`\n
* pixels away from the corresponding part of all previously detected\n * instances), divided by the total number of
parts `numParts`.\n *\n * @param heatmapScores 3-D tensor with shape `[height, width, numParts]`.\n * The value
of heatmapScores[y, x, k] is the score of placing the `k`-th\n * object part at position `(y, x)`.\n *\n * @param
offsets 3-D tensor with shape `[height, width, numParts * 2]`.\n * The value of [offsets[y, x, k], offsets[y, x, k +
numParts]] is the\n * short range offset vector of the `k`-th object part at heatmap\n * position `(y, x)`.\n *\n
* @param displacementsFwd 3-D tensor of shape\n * `[height, width, 2 * num_edges]`, where `num_edges =
num_parts - 1` is the\n * number of edges (parent-child pairs) in the tree. It contains the forward\n *
displacements between consecutive part from the root towards the leaves.\n *\n * @param displacementsBwd 3-D tensor of
shape\n * `[height, width, 2 * num_edges]`, where `num_edges = num_parts - 1` is the\n * number of edges (parent-
child pairs) in the tree. It contains the backward\n * displacements between consecutive part from the root towards
the leaves.\n *\n * @param outputStride The output stride that was used when feed-forwarding\n * through the
PoseNet model. Must be 32, 16, or 8.\n *\n * @param maxPoseDetections Maximum number of returned instance
detections per\n * image.\n *\n * @param scoreThreshold Only return instance detections that have root part\n *
score greater or equal to this value. Defaults to 0.5.\n *\n * @param nmsRadius Non-maximum suppression part
distance. It needs to be\n * strictly positive. Two parts suppress each other if they are less than\n * `nmsRadius`\n
pixels away. Defaults to 20.\n *\n * @return An array of poses and their scores, each containing keypoints and\n *
the corresponding keypoint scores.\n */\nexport function decodeMultiplePoses(\n    scoresBuffer: TensorBuffer3D,\n
offsetsBuffer: TensorBuffer3D,\n    displacementsFwdBuffer: TensorBuffer3D,\n    displacementsBwdBuffer:\n    TensorBuffer3D, outputStride: number,\n    maxPoseDetections: number, scoreThreshold = 0.5, nmsRadius = 20):\n    Pose[] {\n    const poses: Pose[] = [];\n    const queue = buildPartWithScoreQueue(\n        scoreThreshold,\n
kLocalMaximumRadius, scoresBuffer);\n    const squaredNmsRadius = nmsRadius * nmsRadius;\n    // Generate
at most maxDetections object instances per image in\n    // decreasing root part score order.\n    while (poses.length <
maxPoseDetections && !queue.empty()) {\n    // The top element in the queue is the next root candidate.\n    const
root = queue.dequeue();\n    // Part-based non-maximum suppression: We reject a root candidate if it\n    // is
within a disk of `nmsRadius` pixels from the corresponding part of\n    // a previously detected instance.\n    const
rootImageCoords =\n        getImageCoords(root.part, outputStride, offsetsBuffer);\n    if
(withinNmsRadiusOfCorrespondingPoint(\n        poses, squaredNmsRadius, rootImageCoords, root.part.id)) {\n    continue;\n    }\n    // Start a new detection instance at the position of the root.\n    const keypoints =
decodePose(\n        root, scoresBuffer, offsetsBuffer, outputStride, displacementsFwdBuffer,\n
displacementsBwdBuffer);\n    const score = getInstanceScore(poses, squaredNmsRadius, keypoints);\n    poses.push({keypoints, score});\n    }\n    return poses;\n}\n\n/**\n * @license\n * Copyright 2019 Google Inc. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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*\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport { BaseModel } from './base_model';\n\nconst\nimageNetMean = [-123.15, -115.90, -103.06];\n\nexport class ResNet extends BaseModel {\n\n  preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n    return tf.add(input, imageNetMean);\n  }\n\n  nameOutputResults(results: tf.Tensor3D[]) {\n    const [\n      displacementBwd,\n      displacementFwd,\n      heatmap,\n      longOffsets,\n      offsets,\n      partHeatmaps,\n      segmentation,\n      partOffsets,\n    ] = results;\n\n    return {\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets\n    }; \n  }\n}\n\n"/**\n * @license\n * Copyright 2019\n * Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n
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*\n\nconst RESNET50_BASE_URL =\n  'https://storage.googleapis.com/tfjs-\n  models/savedmodel/bodypix/resnet50/';\n\nconst MOBILENET_BASE_URL =\n  'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/mobilenet/';\n\n// The BodyPix 2.0 ResNet50\nmodels use the latest TensorFlow.js 1.0 model\n// format.\n\nexport function resNet50SavedModel(stride: number,\n  quantBytes: number): string {\n  const graphJson = `model-stride${stride}.json`;\n  // quantBytes=4 corresponding\n  to the non-quantized full-precision SavedModel.\n  if (quantBytes === 4) {\n    return RESNET50_BASE_URL +\n      `float` + graphJson;\n  } else {\n    return RESNET50_BASE_URL + `quant${quantBytes}` + graphJson;\n  }\n}\n\n// The BodyPix 2.0 MobileNetV1 models use the latest TensorFlow.js 1.0 model\n// format.\n\nexport\nfunction mobileNetSavedModel(\n  stride: number, multiplier: number, quantBytes: number): string {\n  const\n  toStr: {[key: number]: string} = {1.0: '100', 0.75: '075', 0.50: '050'};\n  const graphJson = `model-\n  stride${stride}.json`;\n  // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n  if\n  (quantBytes === 4) {\n    return MOBILENET_BASE_URL + `float/${toStr[multiplier]}` + graphJson;\n  } else\n  {\n    return MOBILENET_BASE_URL + `quant${quantBytes}/${toStr[multiplier]}` +\n      graphJson;\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache\n * License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required\n * by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n * License for the specific language governing permissions and\n * limitations under the License.\n */\n
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*\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport { BodyPixInput, BodyPixOutputStride, Padding } from\n './types';\n\nimport { Pose, TensorBuffer3D } from './types';\n\nimport { BodyPixInternalResolution } from\n './types';\n\nfunction getSizeFromImageLikeElement(input: HTMLImageElement|\n  HTMLCanvasElement|\n  OffscreenCanvas): [number, number] {\n  if ('offsetHeight' in input\n    && input.offsetHeight !== 0\n    && 'offsetWidth' in input\n    && input.offsetWidth !== 0) {\n    return\n    [input.offsetHeight, input.offsetWidth];\n  } else if (input.height !== null && input.width !== null) {\n    return\n    [input.height, input.width];\n  } else {\n    throw new Error(\n      `HTMLImageElement must have height and\n      width attributes set.`);\n  }\n}\n\nfunction getSizeFromVideoElement(input: HTMLVideoElement): [number,\n  number] {\n  if (input.hasAttribute('height') && input.hasAttribute('width')) {\n    // Prioritizes user specified height\n
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and width.\n // We can't test the .height and .width properties directly,\n // because they evaluate to 0 if unset.\n
return [input.height, input.width];\n } else {\n return [input.videoHeight, input.videoWidth];\n }\n}\n\nexport
function getInputSize(input: BodyPixInput): [number, number] {\n if ((typeof (HTMLCanvasElement) !==
'undefined' &&\n input instanceof HTMLCanvasElement) ||\n (typeof (OffscreenCanvas) !== 'undefined'
&&\n input instanceof OffscreenCanvas) ||\n (typeof (HTMLImageElement) !== 'undefined' &&\n
input instanceof HTMLImageElement)) {\n return getSizeFromImageLikeElement(input);\n } else if (typeof
(ImageData) !== 'undefined' && input instanceof ImageData) {\n return [input.height, input.width];\n } else if (
typeof (HTMLVideoElement) !== 'undefined' &&\n input instanceof HTMLVideoElement) {\n return
getSizeFromVideoElement(input);\n } else if (input instanceof tf.Tensor) {\n return [input.shape[0],
input.shape[1]];\n } else {\n throw new Error(`error: Unknown input type: ${input}.`);\n }\n}\n\nfunction
isValidInputResolution(\n resolution: number, outputStride: number): boolean {\n return (resolution - 1) %
outputStride === 0;\n}\n\nexport function toValidInputResolution(\n inputResolution: number, outputStride:
BodyPixOutputStride): number {\n if (isValidInputResolution(inputResolution, outputStride)) {\n return
inputResolution;\n }\n\n return Math.floor(inputResolution / outputStride) * outputStride + 1;\n}\n\nconst
INTERNAL_RESOLUTION_STRING_OPTIONS = {\n low: 'low',\n medium: 'medium',\n high: 'high',\n full:
'full'\n};\n\nconst INTERNAL_RESOLUTION_PERCENTAGES = {\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.low]: 0.25,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.medium]: 0.5,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.high]: 0.75,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.full]: 1.0\n};\n\nconst MIN_INTERNAL_RESOLUTION =
0.1;\n\nconst MAX_INTERNAL_RESOLUTION = 2.0;\n\nfunction toInternalResolutionPercentage(\n
internalResolution: BodyPixInternalResolution): number {\n if (typeof internalResolution === 'string') {\n const
result = INTERNAL_RESOLUTION_PERCENTAGES[internalResolution];\n\n tf.util.assert(\n typeof result
=== 'number',\n () => `string value of inputResolution must be one of ${\n
Object.values(INTERNAL_RESOLUTION_STRING_OPTIONS)\n .join(',') } but was
${internalResolution}.`);\n return result;\n } else {\n tf.util.assert(\n typeof internalResolution === 'number'
&&\n internalResolution <= MAX_INTERNAL_RESOLUTION &&\n internalResolution >=
MIN_INTERNAL_RESOLUTION,\n () =>\n `inputResolution must be a string or number between ${\n
MIN_INTERNAL_RESOLUTION} and ${MAX_INTERNAL_RESOLUTION}, but ` +\n `was
${internalResolution}`);\n\n return internalResolution;\n }\n}\n\nexport function
toInputResolutionHeightAndWidth(\n internalResolution: BodyPixInternalResolution,\n outputStride:
BodyPixOutputStride,\n [inputHeight, inputWidth]: [number, number]): [number, number] {\n const
internalResolutionPercentage =\n toInternalResolutionPercentage(internalResolution);\n\n return [\n
toValidInputResolution(\n inputHeight * internalResolutionPercentage, outputStride),\n
toValidInputResolution(\n inputWidth * internalResolutionPercentage, outputStride)\n ];\n}\n\nexport function
toInputTensor(input: BodyPixInput) {\n // TODO: tf.browser.fromPixels types to support OffscreenCanvas\n //
@ts-ignore\n return input instanceof tf.Tensor ? input : tf.browser.fromPixels(input);\n}\n\nexport function
resizeAndPadTo(\n imageTensor: tf.Tensor3D, [targetH, targetW]: [number, number],\n flipHorizontal = false):
{\n resizedAndPadded: tf.Tensor3D,\n paddedBy: [[number, number], [number, number]]\n } {\n const [height,
width] = imageTensor.shape;\n\n const targetAspect = targetW / targetH;\n const aspect = width / height;\n\n let
resizeW: number;\n let resizeH: number;\n let padL: number;\n let padR: number;\n let padT: number;\n let
padB: number;\n\n if (aspect > targetAspect) {\n // resize to have the larger dimension match the shape.\n
resizeW = targetW;\n resizeH = Math.ceil(resizeW / aspect);\n\n const padHeight = targetH - resizeH;\n padL
= 0;\n padR = 0;\n padT = Math.floor(padHeight / 2);\n padB = targetH - (resizeH + padT);\n } else {\n
resizeH = targetH;\n resizeW = Math.ceil(targetH * aspect);\n\n const padWidth = targetW - resizeW;\n padL
= Math.floor(padWidth / 2);\n padR = targetW - (resizeW + padL);\n padT = 0;\n padB = 0;\n }\n\n const
resizedAndPadded = tf.tidy(() => {\n // resize to have largest dimension match image\n let resized:
tf.Tensor3D;\n if (flipHorizontal) {\n resized = tf.image.resizeBilinear(\n tf.reverse(imageTensor, 1),

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[resizeH, resizeW]);\n  } else {\n    resized = tf.image.resizeBilinear(imageTensor, [resizeH, resizeW]);\n  }\n\n  const padded = tf.pad3d(resized, [[padT, padB], [padL, padR], [0, 0]]);\n\n  return padded;\n });\n\n return\n {resizedAndPadded, paddedBy: [[padT, padB], [padL, padR]]};\n }\n\n\nexport function\n scaleAndCropToInputTensorShape(\n  tensor: tf.Tensor3D,\n  [inputTensorHeight, inputTensorWidth]: [number,\n  number],\n  [resizedAndPaddedHeight, resizedAndPaddedWidth]: [number, number],\n  [[padT, padB], [padL,\n  padR]]: [[number, number], [number, number]],\n  applySigmoidActivation = false): tf.Tensor3D {\n  return\n  tf.tidy(() => {\n    let inResizedAndPadded: tf.Tensor3D = tf.image.resizeBilinear(tensor,\n  [resizedAndPaddedHeight, resizedAndPaddedWidth], true);\n\n    if (applySigmoidActivation) {\n      inResizedAndPadded = tf.sigmoid(inResizedAndPadded);\n    }\n\n    return removePaddingAndResizeBack(\n  inResizedAndPadded, [inputTensorHeight, inputTensorWidth],\n    [[padT, padB], [padL, padR]]);\n  });\n}\n\n\nexport function removePaddingAndResizeBack(\n  resizedAndPadded: tf.Tensor3D,\n  [originalHeight,\n  originalWidth]: [number, number],\n  [[padT, padB], [padL, padR]]: [[number, number], [number, number]]):\n  tf.Tensor3D {\n  return tf.tidy(() => {\n    const batchedImage: tf.Tensor4D = tf.expandDims(resizedAndPadded);\n\n    return tf.squeeze(tf.image\n      .cropAndResize(\n        batchedImage, [[\n          padT / (originalHeight +\n          padT + padB - 1.0),\n          padL / (originalWidth + padL + padR - 1.0),\n          (padT + originalHeight - 1.0)\n        ]\n        (originalHeight + padT + padB - 1.0),\n          (padL + originalWidth - 1.0) / (originalWidth + padL\n        + padR - 1.0)\n          ]),\n        [0], [originalHeight, originalWidth], [0]);\n  });\n}\n\n\nexport function resize2d(\n  tensor: tf.Tensor2D, resolution: [number, number],\n  nearestNeighbor?: boolean): tf.Tensor2D {\n  return\n  tf.tidy(() => {\n    const batchedImage: tf.Tensor4D = tf.expandDims(tensor, 2);\n\n    return tf.squeeze(\n  tf.image.resizeBilinear(batchedImage, resolution, nearestNeighbor));\n  });\n}\n\n\nexport function\n padAndResizeTo(\n  input: BodyPixInput, [targetH, targetW]: [number, number]):\n  {resized: tf.Tensor3D,\n  padding: Padding} {\n  const [height, width] = getInputSize(input);\n  const targetAspect = targetW / targetH;\n  const aspect = width / height;\n  let [padT, padB, padL, padR] = [0, 0, 0, 0];\n  if (aspect < targetAspect) {\n    // pads the width\n    padT = 0;\n    padB = 0;\n    padL = Math.round(0.5 * (targetAspect * height - width));\n    padR = Math.round(0.5 * (targetAspect * height - width));\n  } else {\n    // pads the height\n    padT = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n    padB = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n    padL = 0;\n    padR = 0;\n  }\n\n  const resized: tf.Tensor3D = tf.tidy(() => {\n    let imageTensor =\n  toInputTensor(input);\n    imageTensor = tf.pad3d(imageTensor, [[padT, padB], [padL, padR], [0, 0]]);\n\n    return\n  tf.image.resizeBilinear(imageTensor, [targetH, targetW]);\n  });\n\n  return {resized, padding: {top: padT, left: padL,\n  right: padR, bottom: padB}};\n }\n\n\nexport async function toTensorBuffers3D(tensors: tf.Tensor3D[]):\n  Promise<TensorBuffer3D[]> {\n  return Promise.all(tensors.map(tensor => tensor.buffer()));\n }\n\n\nexport function\n scalePose(\n  pose: Pose, scaleY: number, scaleX: number, offsetY = 0,\n  offsetX = 0): Pose {\n  return {\n  score: pose.score,\n  keypoints: pose.keypoints.map(({score, part, position}) => ({\n    score,\n    part,\n    position: {\n      x: position.x * scaleX +\n      offsetX,\n      y: position.y * scaleY + offsetY\n    }\n  })))\n }\n }\n\n\nexport function scalePoses(\n  poses: Pose[], scaleY: number, scaleX: number, offsetY = 0, offsetX = 0)\n  {\n  if (scaleX === 1 && scaleY === 1 && offsetY === 0 && offsetX === 0)\n  {\n    return poses;\n  }\n  return\n  poses.map(pose => scalePose(pose, scaleY, scaleX, offsetY, offsetX));\n }\n\n\nexport function\n flipPoseHorizontal(pose: Pose, imageWidth: number): Pose {\n  return {\n  score: pose.score,\n  keypoints:\n  pose.keypoints.map(\n    ({score, part, position}) => ({\n      score,\n      part,\n      position: {x:\n      imageWidth - 1 - position.x, y: position.y\n      })\n    })\n  );\n }\n }\n\n\nexport function flipPosesHorizontal(poses: Pose[],\n  imageWidth: number) {\n  if (imageWidth <= 0)\n  {\n    return poses;\n  }\n  return poses.map(pose =>\n  flipPoseHorizontal(pose, imageWidth));\n }\n\n\nexport function scaleAndFlipPoses(\n  poses: Pose[], [height,\n  width]: [number, number],\n  [inputResolutionHeight, inputResolutionWidth]: [number, number],\n  padding:\n  Padding, flipHorizontal: boolean): Pose[] {\n  const scaleY =\n  (height + padding.top + padding.bottom) /\n  (inputResolutionHeight);\n  const scaleX =\n  (width + padding.left + padding.right) /\n  (inputResolutionWidth);\n\n  const scaledPoses =\n  scalePoses(poses, scaleY, scaleX, -padding.top, -\n  padding.left);\n\n  if (flipHorizontal)\n  {\n    return flipPosesHorizontal(scaledPoses, width);\n  }\n  else {\n    return\n  }

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scaledPoses;\n }\n}\n", "\n**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\nimport {BaseModel} from './base_model';\nimport {decodeOnlyPartSegmentation, decodePartSegmentation, toMaskTensor} from './decode_part_map';\nimport {MobileNet} from './mobilenet';\nimport {decodePersonInstanceMasks, decodePersonInstancePartMasks} from './multi_person/decode_instance_masks';\nimport {decodeMultiplePoses} from './multi_person/decode_multiple_poses';\nimport {ResNet} from './resnet';\nimport {mobileNetSavedModel, resNet50SavedModel} from './saved_models';\nimport {BodyPixArchitecture, BodyPixInput, BodyPixInternalResolution, BodyPixMultiplier, BodyPixOutputStride, BodyPixQuantBytes, Padding} from './types';\nimport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation, SemanticPersonSegmentation} from './types';\nimport {getInputSize, padAndResizeTo, scaleAndCropToInputTensorShape, scaleAndFlipPoses, toInputResolutionHeightAndWidth, toTensorBuffers3D} from './util';\n\nconst APPLY_SIGMOID_ACTIVATION = true;\nconst FLIP_POSES_AFTER_SCALING = false;\n\n**\n * BodyPix model loading is configurable using the following config dictionary.\n *\n `architecture`: BodyPixArchitecture. It determines which BodyPix architecture\n * to load. The supported architectures are: MobileNetV1 and ResNet50.\n *\n `outputStride`: Specifies the output stride of the BodyPix model.\n * The smaller the value, the larger the output resolution, and more accurate\n * the model at the cost of speed. Set this to a larger value to increase speed\n * at the cost of accuracy. Stride 32 is supported for ResNet and\n *\n * stride 8,16,32 are supported for various MobileNetV1 models.\n *\n `multiplier`: An optional number with values: 1.01, 1.0, 0.75, or\n * 0.50. The value is used only by MobileNet architecture. It is the float\n * multiplier for the depth (number of channels) for all convolution ops.\n * The larger the value, the larger the size of the layers, and more accurate\n * the model at the cost of speed. Set this to a smaller value to increase speed\n * at the cost of accuracy.\n *\n `modelUrl`: An optional string that specifies custom url of the model. This\n * is useful for area/countries that don't have access to the model hosted on\n * GCP.\n *\n `quantBytes`: An optional number with values: 1, 2, or 4. This parameter\n * affects weight quantization in the models. The available options are\n * 1 byte, 2 bytes, and 4 bytes. The higher the value, the larger the model size\n * and thus the longer the loading time, the lower the value, the shorter the\n * loading time but lower the accuracy.\n *\n\nexport interface ModelConfig {\n  architecture: BodyPixArchitecture;\n  outputStride: BodyPixOutputStride;\n  multiplier?: BodyPixMultiplier;\n  modelUrl?: string;\n  quantBytes?: BodyPixQuantBytes;\n}\n\n// The default configuration for loading MobileNetV1 based BodyPix.\n// (And for references, the default configuration for loading ResNet\n// based PoseNet is also included).\n//\nconst RESNET_CONFIG = {\n  architecture: 'ResNet50',\n  outputStride: 32,\n  quantBytes: 4,\n} as ModelConfig;\n\nconst MOBILENET_V1_CONFIG = {\n  architecture: 'MobileNetV1',\n  outputStride: 16,\n  quantBytes: 4,\n  multiplier: 0.75,\n} as ModelConfig;\n\nconst VALID_ARCHITECTURE: BodyPixArchitecture[] = ['MobileNetV1', 'ResNet50'];\nconst VALID_STRIDE: {[id: string]: BodyPixOutputStride[]} = {\n  'MobileNetV1': [8, 16, 32],\n  'ResNet50': [32, 16]\n};\nconst VALID_MULTIPLIER: {[id: string]: BodyPixMultiplier[]} = {\n  'MobileNetV1': [0.50, 0.75, 1.0],\n  'ResNet50': [1.0]\n};\nconst VALID_QUANT_BYTES: BodyPixQuantBytes[] = [1, 2, 4];\n\nfunction validateModelConfig(config: ModelConfig): ModelConfig {\n  config = config || MOBILENET_V1_CONFIG;\n  if (config.architecture == null) {\n    config.architecture = 'MobileNetV1';\n  }\n  if (VALID_ARCHITECTURE.indexOf(config.architecture) < 0) {\n    throw new Error(\n      `Invalid architecture ${config.architecture}.` +\n      ` Should be one of ${VALID_ARCHITECTURE}`);\n  }\n  if (config.outputStride
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== null) {\n  config.outputStride = 16;\n }\n if
(VALID_STRIDE[config.architecture].indexOf(config.outputStride) < 0) {\n  throw new Error(\n    `Invalid
outputStride ${config.outputStride}. ` +\n    `Should be one of ${VALID_STRIDE[config.architecture]} ` +\n
`for architecture ${config.architecture}.`);\n }\n\n if (config.multiplier == null) {\n  config.multiplier = 1.0;\n }\n
if (VALID_MULTIPLIER[config.architecture].indexOf(config.multiplier) < 0) {\n  throw new Error(\n
`Invalid multiplier ${config.multiplier}. ` +\n    `Should be one of
${VALID_MULTIPLIER[config.architecture]} ` +\n    `for architecture ${config.architecture}.`);\n }\n\n if
(config.quantBytes == null) {\n  config.quantBytes = 4;\n }\n if
(VALID_QUANT_BYTES.indexOf(config.quantBytes) < 0) {\n  throw new Error(\n    `Invalid quantBytes
${config.quantBytes}. ` +\n    `Should be one of ${VALID_QUANT_BYTES} ` +\n    `for architecture
${config.architecture}.`);\n }\n\n return config;\n}\n\n/**\n * BodyPix inference is configurable using the
following config dictionary.\n *\n * `flipHorizontal`: If the left-right keypoint of poses/part segmentation\n *
should be flipped/mirrored horizontally. This should be set to true for\n * videos where the video is by default
flipped horizontally (i.e. a webcam),\n * and you want the person & body part segmentation to be returned in the
proper\n * orientation.\n *\n * `internalResolution`: Defaults to 'medium'. The internal resolution\n *
percentage that the input is resized to before inference. The larger the\n * internalResolution the more accurate
the model at the cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or a\n *
percentage value between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and
1.0 correspondingly.\n *\n * `segmentationThreshold`: The minimum that segmentation values must\n *
have to be considered part of the person. Affects the generation of the\n * segmentation mask. More specifically,
it is the threshold used to binarize\n * the intermediate person segmentation probability. The probability of each\n *
pixel belongs to a person is in range [0, 1]. If the probability is greater\n * than the `segmentationThreshold`,
it will be set to 1 otherwise 0.\n *\n */\n\nexport interface InferenceConfig {\n  flipHorizontal?: boolean;\n  internalResolution?: BodyPixInternalResolution;\n  segmentationThreshold?: number;\n}\n\n/**\n * Person Inference Config\n *\n * `maxDetections`: Defaults to 10. Maximum number of person pose
detections per\n * image.\n *\n * `scoreThreshold`: Defaults to 0.4. Only return person pose that have root\n *
part score greater or equal to this value.\n *\n * `nmsRadius`: Defaults to 20. Non-maximum suppression part
distance in pixels.\n * It needs to be strictly positive. Two pose keypoints suppress each other if\n *
they are less than `nmsRadius` pixels away.\n */\n\nexport interface PersonInferenceConfig extends
InferenceConfig {\n  maxDetections?: number;\n  scoreThreshold?: number;\n  nmsRadius?: number;\n}\n\n/**\n *
Multiple Person Instance Inference Config\n *\n * `maxDetections`: Defaults to 10. Maximum number of returned
instance\n * segmentation and pose detections per image.\n *\n * `scoreThreshold`: Defaults to 0.4. Only returns
and uses person\n * poses for instance segmentation assignment when the pose has root part score\n * greater or
equal to this value.\n *\n * `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels.\n *
It needs to be strictly positive. Two parts suppress each other if they are\n * less than `nmsRadius` pixels
away.\n *\n * `minKeypointScore`: Default to 0.3. Keypoints above the score are used\n * for matching and
assigning segmentation mask to each person.\n *\n * `refineSteps`: Default to 10. The number of refinement steps
used when\n * assigning the instance segmentation. It needs to be strictly positive. The\n * larger the higher
the accuracy and slower the inference.\n */\n\nexport interface MultiPersonInstanceInferenceConfig extends
InferenceConfig {\n  maxDetections?: number;\n  scoreThreshold?: number;\n  nmsRadius?: number;\n  minKeypointScore?: number;\n  refineSteps?: number;\n}\n\nexport const PERSON_INFERENCE_CONFIG: PersonInferenceConfig = {\n
flipHorizontal: false,\n  internalResolution: 'medium',\n  segmentationThreshold: 0.7,\n  maxDetections: 10,\n  scoreThreshold: 0.4,\n  nmsRadius: 20,\n};\n\nexport const
MULTI_PERSON_INSTANCE_INFERENCE_CONFIG: MultiPersonInstanceInferenceConfig = {\n
flipHorizontal: false,\n  internalResolution: 'medium',\n  segmentationThreshold: 0.7,\n  maxDetections:
10,\n  scoreThreshold: 0.4,\n  nmsRadius: 20,\n  minKeypointScore: 0.3,\n  refineSteps: 10\n};\n\nfunction
validatePersonInferenceConfig(config: PersonInferenceConfig) {\n  const {segmentationThreshold,
maxDetections, scoreThreshold, nmsRadius} =\n  config;\n  if (segmentationThreshold < 0.0 ||
segmentationThreshold > 1.0) {\n    throw new Error(\n      `segmentationThreshold
${segmentationThreshold}. `

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+\n    `Should be in range [0.0, 1.0]`);\n }\n\n if (maxDetections <= 0) {\n  throw new Error(\n    `Invalid
maxDetections ${maxDetections}. ` +\n    `Should be > 0`);\n }\n\n if (scoreThreshold < 0.0 || scoreThreshold >
1.0) {\n  throw new Error(\n    `Invalid scoreThreshold ${scoreThreshold}. ` +\n    `Should be in range [0.0,
1.0]`);\n }\n\n if (nmsRadius <= 0) {\n  throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n
}\n}\n\nfunction validateMultiPersonInstanceInferenceConfig(\n  config: MultiPersonInstanceInferenceConfig) {\n
const {\n  segmentationThreshold,\n  maxDetections,\n  scoreThreshold,\n  nmsRadius,\n  minKeypointScore,\n  refineSteps\n } = config;\n\n if (segmentationThreshold < 0.0 || segmentationThreshold >
1.0) {\n  throw new Error(\n    `segmentationThreshold ${segmentationThreshold}. ` +\n    `Should be in
range [0.0, 1.0]`);\n }\n\n if (maxDetections <= 0) {\n  throw new Error(\n    `Invalid maxDetections
${maxDetections}. ` +\n    `Should be > 0`);\n }\n\n if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {\n  throw
new Error(\n    `Invalid scoreThreshold ${scoreThreshold}. ` +\n    `Should be in range [0.0, 1.0]`);\n }\n\n if
(nmsRadius <= 0) {\n  throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n }\n\n if (minKeypointScore < 0 ||
minKeypointScore > 1) {\n  throw new Error(\n    `Invalid minKeypointScore ${minKeypointScore}. ` +\n
`Should be in range [0.0, 1.0]`);\n }\n\n if (refineSteps <= 0 || refineSteps > 20) {\n  throw new Error(\n
`Invalid refineSteps ${refineSteps}. ` +\n    `Should be in range [1, 20]`);\n }\n}\n\nexport class BodyPix {\n
baseModel: BaseModel;\n\n constructor(net: BaseModel) {\n  this.baseModel = net;\n }\n\n private
predictForPersonSegmentation(input: tf.Tensor3D): {\n  segmentLogits: tf.Tensor3D,\n  heatmapScores:
tf.Tensor3D,\n  offsets: tf.Tensor3D,\n  displacementFwd: tf.Tensor3D,\n  displacementBwd: tf.Tensor3D,\n }
{\n  const {\n    segmentation,\n    heatmapScores,\n    offsets,\n    displacementFwd,\n    displacementBwd,\n
  } = this.baseModel.predict(input);\n  return {\n    segmentLogits: segmentation,\n    heatmapScores,\n
offsets,\n    displacementFwd,\n    displacementBwd,\n  };}\n\n private
predictForPersonSegmentationAndPart(input: tf.Tensor3D): {\n  segmentLogits: tf.Tensor3D,\n
partHeatmapLogits: tf.Tensor3D,\n  heatmapScores: tf.Tensor3D,\n  offsets: tf.Tensor3D,\n  displacementFwd:
tf.Tensor3D,\n  displacementBwd: tf.Tensor3D,\n } {\n  const {\n    segmentation,\n    partHeatmaps,\n
heatmapScores,\n    offsets,\n    displacementFwd,\n    displacementBwd\n  } = this.baseModel.predict(input);\n
return {\n    segmentLogits: segmentation,\n    partHeatmapLogits: partHeatmaps,\n    heatmapScores,\n
offsets,\n    displacementFwd,\n    displacementBwd,\n  };}\n\n private
predictForMultiPersonInstanceSegmentationAndPart(input: tf.Tensor3D):\n  {\n    segmentLogits:
tf.Tensor3D,\n    longOffsets: tf.Tensor3D,\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n
displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n    partHeatmaps: tf.Tensor3D\n  } {\n
const {\n    segmentation,\n    longOffsets,\n    heatmapScores,\n    offsets,\n    displacementFwd,\n
displacementBwd,\n    partHeatmaps,\n  } = this.baseModel.predict(input);\n  return {\n    segmentLogits:
segmentation,\n    longOffsets,\n    heatmapScores,\n    offsets,\n    displacementFwd,\n    displacementBwd,\n
partHeatmaps\n  };}\n}\n\n/**\n * Given an image with people, returns a dictionary of all intermediate\n *
tensors including: 1) a binary array with 1 for the pixels that are part of\n * the person, and 0 otherwise, 2)
heatmapScores, 3) offsets, and 4) paddings.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal resolution\n * that
the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the
cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n * a percentage value
between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n
*\n * @param segmentationThreshold The minimum that segmentation values must have\n * to be considered
part of the person. Affects the generation of the\n * segmentation mask.\n *\n * @return A dictionary containing
`segmentation`, `heatmapScores`, `offsets`,\n * and `padding`:\n * - `segmentation`: A 2d Tensor with 1 for the
pixels that are part of the\n * person, and 0 otherwise. The width and height correspond to the same\n *
dimensions of the input image.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * pose
estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by pose\n * estimation decoding.\n
* - `displacementFwd`: A 3d Tensor of the keypoint forward displacement used\n * by pose estimation decoding.\n

```

* - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used by pose estimation decoding.

* - `padding`: The padding (unit pixels) being applied to the input image before it is fed into the model.

```

\n  */\n segmentPersonActivation(\n  input: BodyPixInput, internalResolution:
BodyPixInternalResolution,\n  segmentationThreshold = 0.5): {\n  segmentation: tf.Tensor2D,\n  heatmapScores: tf.Tensor3D,\n  offsets: tf.Tensor3D,\n  displacementFwd: tf.Tensor3D,\n  displacementBwd:
tf.Tensor3D,\n  padding: Padding,\n  internalResolutionHeightAndWidth: [number, number]\n } {\n  const
[height, width] = getInputSize(input);\n  const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n  internalResolution, this.baseModel.outputStride, [height, width]);\n
const {resized, padding} =\n  padAndResizeTo(input, internalResolutionHeightAndWidth);\n  const {\n
segmentation,\n  heatmapScores,\n  offsets,\n  displacementFwd,\n  displacementBwd\n } = tf.tidy(() =>
{\n  const {\n  segmentLogits,\n  heatmapScores,\n  offsets,\n  displacementFwd,\n
displacementBwd\n } = this.predictForPersonSegmentation(resized);\n  const [resizedHeight, resizedWidth]
= resized.shape;\n  const scaledSegmentScores = scaleAndCropToInputTensorShape(\n  segmentLogits,
[height, width], [resizedHeight, resizedWidth],\n  [[padding.top, padding.bottom], [padding.left,
padding.right]],\n  APPLY_SIGMOID_ACTIVATION);\n  return {\n  segmentation: toMaskTensor(\n
tf.squeeze(scaledSegmentScores), segmentationThreshold),\n  heatmapScores,\n  offsets,\n
displacementFwd,\n  displacementBwd,\n  });\n  resized.dispose();\n  return {\n  segmentation,\n
heatmapScores,\n  offsets,\n  displacementFwd,\n  displacementBwd,\n  padding,\n
internalResolutionHeightAndWidth\n  });\n })\n /**\n  * Given an image with many people, returns a
PersonSegmentation dictionary\n  * that contains the segmentation mask for all people and a single pose.\n  *\n  * Note: The segmentation mask returned by this method covers all people but\n  * the pose works well for one
person. If you want to estimate instance-level\n  * multiple person segmentation & pose for each person, use\n  *
`segmentMultiPerson` instead.\n  *\n  * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n  * The input image to feed
through the network.\n  *\n  * @param config PersonInferenceConfig object that contains\n  * parameters for the
BodyPix inference using person decoding.\n  *\n  * @return A SemanticPersonSegmentation dictionary that
contains height,\n  * width, the flattened binary segmentation mask and the poses for all people.\n  * The width and
height correspond to the same dimensions of the input image.\n  * - `height`: The height of the segmentation data in
pixel unit.\n  * - `width`: The width of the segmentation data in pixel unit.\n  * - `data`: The flattened Uint8Array
of segmentation data. 1 means the pixel\n  * belongs to a person and 0 means the pixel doesn't belong to a person.
The\n  * size of the array is equal to `height` x `width` in row-major order.\n  * - `allPoses`: The 2d poses of all
people.\n  */\n  ^/\n  async segmentPerson(\n  input: BodyPixInput,\n  config: PersonInferenceConfig =
PERSON_INFERENCE_CONFIG): Promise<SemanticPersonSegmentation> {\n  config =
{...PERSON_INFERENCE_CONFIG, ...config};\n  validatePersonInferenceConfig(config);\n  const {\n
segmentation,\n  heatmapScores,\n  offsets,\n  displacementFwd,\n  displacementBwd,\n  padding,\n
internalResolutionHeightAndWidth\n } =\n  this.segmentPersonActivation(\n  input,
config.internalResolution, config.segmentationThreshold);\n  const [height, width] = segmentation.shape;\n
const result = await segmentation.data() as Uint8Array;\n  segmentation.dispose();\n  const tensorBuffers =
await toTensorBuffers3D(\n  [heatmapScores, offsets, displacementFwd, displacementBwd]);\n  const
[scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n  tensorBuffers;\n  let poses =
decodeMultiplePoses(\n  scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n
this.baseModel.outputStride, config.maxDetections,\n  config.scoreThreshold, config.nmsRadius);\n  poses =
scaleAndFlipPoses(\n  poses, [height, width], internalResolutionHeightAndWidth, padding,\n
FLIP_POSES_AFTER_SCALING);\n  heatmapScores.dispose();\n  offsets.dispose();\n
displacementFwd.dispose();\n  displacementBwd.dispose();\n  return {height, width, data: result, allPoses:
poses};\n })\n /**\n  * Given an image with multiple people, returns an *array* of\n  * PersonSegmentation
object. Each element in the array corresponding to one\n  * of the people in the input image. In other words, it
predicts\n  * instance-level multiple person segmentation & pose for each person.\n  *\n  * The model does

```

standard ImageNet pre-processing before inferring through the model. The image pixels should have values [0-255].

@param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement

The input image to feed through the network.

@param config MultiPersonInferenceConfig object that contains parameters for the BodyPix inference using multi-person decoding.

@return An array of PersonSegmentation object, each containing a width, height, a binary array (1 for the pixels that are part of the person, and 0 otherwise) and 2D pose. The array size corresponds to the number of pixels in the image. The width and height correspond to the dimensions of the image the binary array is shaped to, which are the same dimensions of the input image.

```

async segmentMultiPerson(input: BodyPixInput, config: MultiPersonInstanceInferenceConfig = MULTI_PERSON_INSTANCE_INFERENCE_CONFIG): Promise<PersonSegmentation[]> {
  config = {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};
  validateMultiPersonInstanceInferenceConfig(config);
  const [height, width] = getInputSize(input);
  const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(config.internalResolution, this.baseModel.outputStride, [height, width]);
  const {resized, padding} = padAndResizeTo(input, internalResolutionHeightAndWidth);
  const {segmentation, longOffsets, heatmapScoresRaw, offsetsRaw, displacementFwdRaw, displacementBwdRaw, } = tf.tidy(() => {
    const {segmentLogits, longOffsets, heatmapScores, offsets, displacementFwd, displacementBwd, } = this.predictForMultiPersonInstanceSegmentationAndPart(resized);
    const scaledSegmentScores = scaleAndCropToInputTensorShape(segmentLogits, [height, width], internalResolutionHeightAndWidth, [[padding.top, padding.bottom], [padding.left, padding.right]], APPLY_SIGMOID_ACTIVATION);
    const longOffsetsResized = false;
    let scaledLongOffsets;
    if (longOffsetsResized) {
      scaledLongOffsets = scaleAndCropToInputTensorShape(longOffsets, [height, width], internalResolutionHeightAndWidth, [[padding.top, padding.bottom], [padding.left, padding.right]], APPLY_SIGMOID_ACTIVATION);
    } else {
      scaledLongOffsets = longOffsets;
    }
    const segmentation = toMaskTensor(tf.squeeze(scaledSegmentScores), config.segmentationThreshold);
    return {segmentation, longOffsets: scaledLongOffsets, heatmapScoresRaw: heatmapScores, offsetsRaw: offsets, displacementFwdRaw: displacementFwd, displacementBwdRaw: displacementBwd, };
  });
  const tensorBuffers = await toTensorBuffers3D([heatmapScoresRaw, offsetsRaw, displacementFwdRaw, displacementBwdRaw]);
  const [scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] = tensorBuffers;
  let poses = decodeMultiplePoses(scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf, this.baseModel.outputStride, config.maxDetections, config.scoreThreshold, config.nmsRadius);
  poses = scaleAndFlipPoses(poses, [height, width], internalResolutionHeightAndWidth, padding, FLIP_POSES_AFTER_SCALING);
  const instanceMasks = await decodePersonInstanceMasks(segmentation, longOffsets, poses, height, width, this.baseModel.outputStride, internalResolutionHeightAndWidth, padding, config.scoreThreshold, config.refineSteps, config.minKeypointScore, config.maxDetections);
  resized.dispose();
  segmentation.dispose();
  longOffsets.dispose();
  heatmapScoresRaw.dispose();
  offsetsRaw.dispose();
  displacementFwdRaw.dispose();
  displacementBwdRaw.dispose();
  return instanceMasks;
}

```

Given an image with many people, returns a dictionary containing: height, width, a tensor with a part id from 0-24 for the pixels that are part of a corresponding body part, and -1 otherwise. This does standard ImageNet pre-processing before inferring through the model. The image should pixels should have values [0-255].

@param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement

The input image to feed through the network.

@param internalResolution Defaults to 'medium'. The internal resolution percentage that the input is resized to before inference. The larger the internalResolution the more accurate the model at the cost of slower prediction times. Available values are 'low', 'medium', 'high', 'full', or a percentage value between 0 and 1. The values 'low', 'medium', 'high', and 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.

@param segmentationThreshold The minimum that segmentation values must have to be considered part of the person. Affects the clipping of the colored part image.

```

@return A dictionary containing `partSegmentation`, `heatmapScores`, \n * `offsets`, and `padding`:\n * -
`partSegmentation`: A 2d Tensor with a part id from 0-24 for\n * the pixels that are part of a corresponding body
part, and -1 otherwise.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * single-person
pose estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by single-person pose\n *
estimation decoding.\n * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement\n * used by
pose estimation decoding.\n * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n *
by pose estimation decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n *
before it is fed into the model.\n */\n segmentPersonPartsActivation(\n  input: BodyPixInput,
internalResolution: BodyPixInternalResolution,\n  segmentationThreshold = 0.5): {\n  partSegmentation:
tf.Tensor2D,\n  heatmapScores: tf.Tensor3D,\n  offsets: tf.Tensor3D,\n  displacementFwd: tf.Tensor3D,\n
displacementBwd: tf.Tensor3D,\n  padding: Padding,\n  internalResolutionHeightAndWidth: [number, number]\n
} {\n  const [height, width] = getInputSize(input);\n  const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n    internalResolution, this.baseModel.outputStride, [height, width]);\n
const {\n  resized,\n  padding,\n } = padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n const
{\n  partSegmentation,\n  heatmapScores,\n  offsets,\n  displacementFwd,\n  displacementBwd\n } =
tf.tidy(() => {\n  const {\n    segmentLogits,\n    partHeatmapLogits,\n    heatmapScores,\n    offsets,\n
displacementFwd,\n    displacementBwd\n } = this.predictForPersonSegmentationAndPart(resized);\n\n
const [resizedHeight, resizedWidth] = resized.shape;\n\n    const scaledSegmentScores =
scaleAndCropToInputTensorShape(\n      segmentLogits, [height, width], [resizedHeight, resizedWidth],\n
[[padding.top, padding.bottom], [padding.left, padding.right]],\n      APPLY_SIGMOID_ACTIVATION);\n\n
const scaledPartHeatmapScore = scaleAndCropToInputTensorShape(\n      partHeatmapLogits, [height, width],
[resizedHeight, resizedWidth],\n      [[padding.top, padding.bottom], [padding.left, padding.right]],\n
APPLY_SIGMOID_ACTIVATION);\n  const segmentation =\n  toMaskTensor(tf.squeeze(scaledSegmentScores), segmentationThreshold);\n  return {\n  partSegmentation:\n
decodePartSegmentation(segmentation, scaledPartHeatmapScore),\n  heatmapScores,\n  offsets,\n
displacementFwd,\n  displacementBwd,\n  });\n });\n resized.dispose();\n return {\n
partSegmentation,\n  heatmapScores,\n  offsets,\n  displacementFwd,\n  displacementBwd,\n
padding,\n  internalResolutionHeightAndWidth\n };}\n\n /**\n * Given an image with many people,
returns a PartSegmentation dictionary that\n * contains the body part segmentation mask for all people and a single
pose.\n * \n * Note: The body part segmentation mask returned by this method covers all\n * people but the pose
works well when there is one person. If you want to\n * estimate instance-level multiple person body part
segmentation & pose for\n * each person, use `segmentMultiPersonParts` instead.\n * \n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n * \n * @param config PersonInferenceConfig object that contains\n * parameters for the
BodyPix inference using single person decoding.\n * \n * @return A SemanticPartSegmentation dictionary that
contains height, width,\n * the flattened binary segmentation mask and the pose for the person. The\n * width and
height correspond to the same dimensions of the input image.\n * - `height`: The height of the person part
segmentation data in pixel unit.\n * - `width`: The width of the person part segmentation data in pixel unit.\n * -
`data`: The flattened Int32Array of person part segmentation data with a\n * part id from 0-24 for the pixels that are
part of a corresponding body\n * part, and -1 otherwise. The size of the array is equal to `height` x\n * `width` in
row-major order.\n * - `allPoses`: The 2d poses of all people.\n */\n async segmentPersonParts(\n  input:
BodyPixInput,\n  config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n  Promise<SemanticPartSegmentation> {\n  config = {...PERSON_INFERENCE_CONFIG, ...config};\n\n
validatePersonInferenceConfig(config);\n  const {\n  partSegmentation,\n  heatmapScores,\n  offsets,\n
displacementFwd,\n  displacementBwd,\n  padding,\n  internalResolutionHeightAndWidth\n } =\n
this.segmentPersonPartsActivation(\n    input, config.internalResolution, config.segmentationThreshold);\n\n
const [height, width] = partSegmentation.shape;\n  const data = await partSegmentation.data() as Int32Array;\n
partSegmentation.dispose();\n\n  const tensorBuffers = await toTensorBuffers3D(\n    [heatmapScores, offsets,

```

```

displacementFwd, displacementBwd]);\n  const [scoresBuf, offsetsBuf, displacementsFwdBuf,
displacementsBwdBuf] =\n    tensorBuffers;\n\n  let poses = decodeMultiplePoses(\n    scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf,\n    this.baseModel.outputStride, config.maxDetections,\n    config.scoreThreshold, config.nmsRadius);\n\n  poses = scaleAndFlipPoses(\n    poses, [height, width],
internalResolutionHeightAndWidth, padding,\n    FLIP_POSES_AFTER_SCALING);\n\n  heatmapScores.dispose();\n  offsets.dispose();\n  displacementFwd.dispose();\n  displacementBwd.dispose();\n\n  return {height, width, data, allPoses: poses};\n  }\n\n  /**\n   * Given an image with multiple people, returns an
*array* of PartSegmentation\n   * object. Each element in the array corresponding to one\n   * of the people in the
input image. In other words, it predicts\n   * instance-level multiple person body part segmentation & pose for
each\n   * person.\n   *\n   * This does standard ImageNet pre-processing before inferring through\n   * the model.
The image pixels should have values [0-255].\n   *\n   * @param input\n   *
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n   * image to feed
through the network.\n   *\n   * @param config MultiPersonInferenceConfig object that contains\n   * parameters for
the BodyPix inference using multi-person decoding.\n   *\n   * @return An array of PartSegmentation object, each
containing a width,\n   * height, a flattened array (with part id from 0-24 for the pixels that are\n   * part of a
corresponding body part, and -1 otherwise) and 2D pose. The width\n   * and height correspond to the dimensions of
the image. Each flattened part\n   * segmentation array size is equal to `height` x `width`.\n   */\n  async
segmentMultiPersonParts(\n    input: BodyPixInput,\n    config: MultiPersonInstanceInferenceConfig =\n    MULTI_PERSON_INSTANCE_INFERENCE_CONFIG): Promise<PartSegmentation[]> {\n    config =
{...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n\n    validateMultiPersonInstanceInferenceConfig(config);\n    const [height, width] = getInputSize(input);\n    const
internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n      config.internalResolution,
this.baseModel.outputStride,\n      [height, width]);\n    const {resized, padding} =\n      padAndResizeTo(input,
internalResolutionHeightAndWidth);\n    const {\n      segmentation,\n      longOffsets,\n      heatmapScoresRaw,\n      offsetsRaw,\n      displacementFwdRaw,\n      displacementBwdRaw,\n      partSegmentation,\n    } = tf.tidy(() =>
{\n      const {\n        segmentLogits,\n        longOffsets,\n        heatmapScores,\n        offsets,\n        displacementFwd,\n        displacementBwd,\n        partHeatmaps\n      } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n\n      // decoding with scaling.\n      const
scaledSegmentScores = scaleAndCropToInputTensorShape(\n        segmentLogits, [height, width],
internalResolutionHeightAndWidth,\n        [[padding.top, padding.bottom], [padding.left, padding.right]],\n        APPLY_SIGMOID_ACTIVATION);\n\n      // decoding with scaling.\n      const scaledPartSegmentationScores =
scaleAndCropToInputTensorShape(\n        partHeatmaps, [height, width], internalResolutionHeightAndWidth,\n        [[padding.top, padding.bottom], [padding.left, padding.right]],\n        APPLY_SIGMOID_ACTIVATION);\n\n      const scaledLongOffsets = longOffsets;\n      const segmentation = toMaskTensor(\n        tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n      const partSegmentation =\n        decodeOnlyPartSegmentation(scaledPartSegmentationScores);\n      return {\n        segmentation,\n        longOffsets:\n        scaledLongOffsets,\n        heatmapScoresRaw: heatmapScores,\n        offsetsRaw: offsets,\n        displacementFwdRaw: displacementFwd,\n        displacementBwdRaw: displacementBwd,\n        partSegmentation\n      };\n    });\n\n    const tensorBuffers = await toTensorBuffers3D(\n      [heatmapScoresRaw,
offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n    const [scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf] =\n      tensorBuffers;\n\n    let poses = decodeMultiplePoses(\n      scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n      this.baseModel.outputStride,
config.maxDetections,\n      config.scoreThreshold, config.nmsRadius);\n\n    poses = scaleAndFlipPoses(\n      poses, [height, width], internalResolutionHeightAndWidth, padding,\n      FLIP_POSES_AFTER_SCALING);\n\n    const instanceMasks = await decodePersonInstancePartMasks(\n      segmentation, longOffsets, partSegmentation,
poses, height, width,\n      this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n      config.scoreThreshold, config.refineSteps, config.minKeypointScore,\n      config.maxDetections);\n\n    resized.dispose();\n    segmentation.dispose();\n    longOffsets.dispose();\n    heatmapScoresRaw.dispose();\n

```

```

offsetsRaw.dispose();\n displacementFwdRaw.dispose();\n displacementBwdRaw.dispose();\n
partSegmentation.dispose();\n\n return instanceMasks;\n }\n\n public dispose() {\n this.baseModel.dispose();\n
}\n}\n\n/**\n * Loads the MobileNet BodyPix model.\n */\n\n async function loadMobileNet(config: ModelConfig):
Promise<BodyPix> {\n const outputStride = config.outputStride;\n const quantBytes = config.quantBytes;\n const
multiplier = config.multiplier;\n if (tf == null) {\n throw new Error(\n `Cannot find TensorFlow.js. If you are
using a <script> tag, please ` +\n `also include @tensorflow/tfjs on the page before using this\n model.`);\n
}\n\n const url = mobileNetSavedModel(outputStride, multiplier, quantBytes);\n const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n const mobilenet = new MobileNet(graphModel, outputStride);\n
return new BodyPix(mobilenet);\n}\n\n/**\n * Loads the ResNet BodyPix model.\n */\n\n async function
loadResNet(config: ModelConfig): Promise<BodyPix> {\n const outputStride = config.outputStride;\n const
quantBytes = config.quantBytes;\n if (tf == null) {\n throw new Error(\n `Cannot find TensorFlow.js. If you
are using a <script> tag, please ` +\n `also include @tensorflow/tfjs on the page before using this\n
model.`);\n }\n\n const url = resNet50SavedModel(outputStride, quantBytes);\n const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n const resnet = new ResNet(graphModel, outputStride);\n return
new BodyPix(resnet);\n}\n\n/**\n * Loads the BodyPix model instance from a checkpoint, with the ResNet\n * or
MobileNet architecture. The model to be loaded is configurable using the\n * config dictionary ModelConfig. Please
find more details in the\n * documentation of the ModelConfig.\n */\n\n * @param config ModelConfig dictionary that
contains parameters for\n * the BodyPix loading process. Please find more details of each parameters\n * in the
documentation of the ModelConfig interface. The predefined\n * `MOBILENET_V1_CONFIG` and
`RESNET_CONFIG` can also be used as references\n * for defining your customized config.\n */\n\n export async
function load(config: ModelConfig = MOBILENET_V1_CONFIG): Promise<BodyPix> {\n config =
validateModelConfig(config);\n if (config.architecture === 'ResNet50') {\n return loadResNet(config);\n } else if
(config.architecture === 'MobileNetV1') {\n return loadMobileNet(config);\n } else {\n return null;\n
}\n}\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n */\n
=====\n\n
*/\n\n import {cpuBlur} from './blur';\n import {Color, PartSegmentation, PersonSegmentation} from
 './types';\n import {SemanticPartSegmentation, SemanticPersonSegmentation} from './types';\n import {getInputSize}
from './util';\n\n export type Canvas = HTMLCanvasElement | OffscreenCanvas;\n\n const offScreenCanvases:
{[name: string]: Canvas} = {};\n\n type ImageType = HTMLImageElement|HTMLVideoElement|Canvas;\n\n type
HasDimensions = {\n width: number,\n height: number\n};\n\n function isSafari() {\n return
(/^(?!chrome|android).*safari/i.test(navigator.userAgent));\n}\n\n function assertSameDimensions(\n {width:
widthA, height: heightA}: HasDimensions,\n {width: widthB, height: heightB}: HasDimensions, nameA: string,\n
nameB: string) {\n if (widthA !== widthB || heightA !== heightB) {\n throw new Error(`error: dimensions must
match. ${nameA} has dimensions ${\n widthA}x${heightA}, ${nameB} has dimensions
${widthB}x${heightB}`);\n }\n}\n\n function flipCanvasHorizontal(canvas: Canvas) {\n const ctx =
canvas.getContext('2d');\n ctx.scale(-1, 1);\n ctx.translate(-canvas.width, 0);\n}\n\n function
drawWithCompositing(\n ctx: CanvasRenderingContext2D|OffscreenCanvasRenderingContext2D,\n image:
Canvas|ImageType,\n compositeOperation: string) {\n ctx.globalCompositeOperation = compositeOperation;\n
ctx.drawImage(image, 0, 0);\n}\n\n function createOffScreenCanvas(): Canvas {\n if (typeof document !==
'undefined') {\n return document.createElement('canvas');\n } else if (typeof OffscreenCanvas !== 'undefined')
{\n return new OffscreenCanvas(0, 0);\n } else {\n throw new Error('Cannot create a canvas in this context');\n
}\n}\n\n function ensureOffScreenCanvasCreated(id: string): Canvas {\n if (!offScreenCanvases[id]) {\n
offScreenCanvases[id] = createOffScreenCanvas();\n }\n return offScreenCanvases[id];\n}\n\n function

```



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drawAndBlurImageOnCanvas(\n  image: ImageType, blurAmount: number, canvas: Canvas) {\n  const {height, width} = image;\n  const ctx = canvas.getContext('2d');\n  canvas.width = width;\n  canvas.height = height;\n  ctx.clearRect(0, 0, width, height);\n  ctx.save();\n  if (isSafari()) {\n    cpuBlur(canvas, image, blurAmount);\n  } else {\n    // tslint:disable:no-any\n    (ctx as any).filter = `blur(${blurAmount}px)`;\n    ctx.drawImage(image, 0, 0, width, height);\n  }\n  ctx.restore();\n}\n\nfunction drawAndBlurImageOnOffScreenCanvas(\n  image: ImageType, blurAmount: number,\n  offscreenCanvasName: string): Canvas {\n  const canvas = ensureOffscreenCanvasCreated(offscreenCanvasName);\n  if (blurAmount === 0) {\n    renderImageToCanvas(image, canvas);\n  } else {\n    drawAndBlurImageOnCanvas(image, blurAmount, canvas);\n  }\n  return canvas;\n}\n\nfunction renderImageToCanvas(image: ImageType, canvas: Canvas) {\n  const {width, height} = image;\n  canvas.width = width;\n  canvas.height = height;\n  const ctx = canvas.getContext('2d');\n  ctx.drawImage(image, 0, 0, width, height);\n}\n\n/**\n * Draw an image on a canvas\n */\nfunction renderImageDataToCanvas(image: ImageData, canvas: Canvas) {\n  canvas.width = image.width;\n  canvas.height = image.height;\n  const ctx = canvas.getContext('2d');\n  ctx.putImageData(image, 0, 0);\n}\n\nfunction renderImageDataToOffScreenCanvas(\n  image: ImageData, canvasName: string): Canvas {\n  const canvas = ensureOffscreenCanvasCreated(canvasName);\n  renderImageDataToCanvas(image, canvas);\n  return canvas;\n}\n\n/**\n * Given the output from estimating multi-person segmentation, generates an\n * image with foreground and background color at each pixel determined by the\n * corresponding binary segmentation value at the pixel from the output. In\n * other words, pixels where there is a person will be colored with foreground\n * color and where there is not a person will be colored with background color.\n */\n * @param personOrPartSegmentation The output from\n * `segmentPerson`, `segmentMultiPerson`,\n * `segmentPersonParts` or `segmentMultiPersonParts`. They can\n * be SemanticPersonSegmentation object, an array of PersonSegmentation object,\n * SemanticPartSegmentation object, or an array of PartSegmentation object.\n * @param foreground Default to {r:0, g:0, b:0, a: 0}. The foreground color\n * (r,g,b,a) for visualizing pixels that belong to people.\n * @param background Default to {r:0, g:0, b:0, a: 255}. The background color\n * (r,g,b,a) for visualizing pixels that don't belong to people.\n * @param drawContour Default to false. Whether to draw the contour around each\n * person's segmentation mask or body part mask.\n * @param foregroundIds Default to [1]. The integer values that represent\n * foreground. For person segmentation, 1 is the foreground. For body part\n * segmentation, it can be a subset of all body parts ids.\n * @returns An ImageData with the same width and height of\n * all the PersonSegmentation in multiPersonSegmentation, with opacity and\n * transparency at each pixel determined by the corresponding binary\n * segmentation value at the pixel from the output.\n */\nexport function toMask(\n  personOrPartSegmentation: SemanticPersonSegmentation|\n  SemanticPartSegmentation|PersonSegmentation[]|PartSegmentation[],\n  foreground: Color = {\n    r: 0,\n    g: 0,\n    b: 0,\n    a: 0\n  },\n  background: Color = {\n    r: 0,\n    g: 0,\n    b: 0,\n    a: 255\n  },\n  drawContour = false, foregroundIds: number[] = [1]): ImageData {\n  if (Array.isArray(personOrPartSegmentation) &&\n    personOrPartSegmentation.length === 0) {\n    return null;\n  }\n  let multiPersonOrPartSegmentation:\n    Array<SemanticPersonSegmentation|SemanticPartSegmentation|\n    PersonSegmentation|PartSegmentation>;\n  if (!Array.isArray(personOrPartSegmentation)) {\n    multiPersonOrPartSegmentation = [personOrPartSegmentation];\n  } else {\n    multiPersonOrPartSegmentation = personOrPartSegmentation;\n  }\n  const {width, height} = multiPersonOrPartSegmentation[0];\n  const bytes = new Uint8ClampedArray(width * height * 4);\n  function drawStroke(\n    bytes: Uint8ClampedArray, row: number, column: number, width: number,\n    radius: number, color: Color = {r: 0, g: 255, b: 255, a: 255}) {\n    for (let i = -radius; i <= radius; i++) {\n      for (let j = -radius; j <= radius; j++) {\n        if (i !== 0 && j !== 0) {\n          const n = (row + i) * width + (column + j);\n          bytes[4 * n + 0] = color.r;\n          bytes[4 * n + 1] = color.g;\n          bytes[4 * n + 2] = color.b;\n          bytes[4 * n + 3] = color.a;\n        }\n      }\n    }\n  }\n  function isSegmentationBoundary(\n    segmentationData: Uint8Array|Int32Array,\n    row: number,\n    column: number,\n    width: number,\n    foregroundIds: number[] = [1],\n    radius = 1,\n  ): boolean {\n    let numberBackgroundPixels = 0;\n    for (let i = -radius; i <= radius; i++) {\n      for (let j = -radius; j <= radius; j++) {\n        if (i !== 0 && j !== 0) {\n          const n = (row + i) * width + (column + j);\n          if

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(!foregroundIds.some(id => id === segmentationData[n])) {\n      numberBackgroundPixels += 1;\n    }\n  }\n  }\n  return numberBackgroundPixels > 0;\n  }\n  for (let i = 0; i < height; i += 1) {\n    for (let j = 0; j < width; j += 1) {\n      const n = i * width + j;\n      bytes[4 * n + 0] = background.r;\n      bytes[4 * n + 1] = background.g;\n      bytes[4 * n + 2] = background.b;\n      bytes[4 * n + 3] = background.a;\n      for (let k = 0; k < multiPersonOrPartSegmentation.length; k++) {\n        if (foregroundIds.some(\n          id => id === multiPersonOrPartSegmentation[k].data[n])) {\n          bytes[4 * n] = foreground.r;\n          bytes[4 * n + 1] = foreground.g;\n          bytes[4 * n + 2] = foreground.b;\n          bytes[4 * n + 3] = foreground.a;\n          const isBoundary = isSegmentationBoundary(\n            multiPersonOrPartSegmentation[k].data, i, j, width,\n            foregroundIds);\n          if (drawContour && i - 1 >= 0 && i + 1 < height && j - 1 >= 0 &&\n            j + 1 < width && isBoundary) {\n            drawStroke(bytes, i, j, width, 1);\n          }\n        }\n      }\n    }\n  }\n  return new ImageData(bytes, width, height);\n}\n\nconst RAINBOW_PART_COLORS: Array<[number, number, number]> =\n[\n  [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n  [238, 67, 149], [255, 78, 125], [255, 94, 99], [255, 115, 75],\n  [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n  [175, 240, 91], [135, 245, 87], [96, 247, 96], [64, 243, 115],\n  [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n  [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195]\n];\n\n/**\n * Given the output from person body part segmentation (or multi-person\n * instance body part segmentation) and an array of colors indexed by part id,\n * generates an image with the corresponding color for each part at each pixel,\n * and white pixels where there is no part.\n *\n * @param partSegmentation The output from segmentPersonParts\n * or segmentMultiPersonParts. The former is a SemanticPartSegmentation\n * object and later is an array of PartSegmentation object.\n *\n * @param partColors A multi-dimensional array of rgb colors indexed by\n * part id. Must have 24 colors, one for every part.\n *\n * @returns An ImageData with the same width and height of all the element in\n * multiPersonPartSegmentation, with the corresponding color for each part at\n * each pixel, and black pixels where there is no part.\n */\nexport function toColoredPartMask(\n  partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n  partColors: Array<[number, number, number]> =\n    RAINBOW_PART_COLORS): ImageData {\n  if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n    return null;\n  }\n  let multiPersonPartSegmentation;\n  if (!Array.isArray(partSegmentation)) {\n    multiPersonPartSegmentation = [partSegmentation];\n  } else {\n    multiPersonPartSegmentation = partSegmentation;\n  }\n  const {width, height} = multiPersonPartSegmentation[0];\n  const bytes = new Uint8ClampedArray(width * height * 4);\n  for (let i = 0; i < height * width; ++i) {\n    // invert mask. Invert the segmentation mask.\n    const j = i * 4;\n    bytes[j + 0] = 255;\n    bytes[j + 1] = 255;\n    bytes[j + 2] = 255;\n    bytes[j + 3] = 255;\n    for (let k = 0; k < multiPersonPartSegmentation.length; k++) {\n      const partId = multiPersonPartSegmentation[k].data[i];\n      if (partId !== -1) {\n        const color = partColors[partId];\n        if (!color) {\n          throw new Error(`No color could be found for part id ${partId}`);\n        }\n        bytes[j + 0] = color[0];\n        bytes[j + 1] = color[1];\n        bytes[j + 2] = color[2];\n        bytes[j + 3] = 255;\n      }\n    }\n  }\n  return new ImageData(bytes, width, height);\n}\n\nconst CANVAS_NAMES = {\n  blurred: 'blurred',\n  blurredMask: 'blurred-mask',\n  mask: 'mask',\n  lowresPartMask: 'lowres-part-mask',\n};\n\n/**\n * Given an image and a maskImage of type ImageData, draws the image with the\n * mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this should be\n * generated by toMask or toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param maskBlurAmount How many pixels to blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the result should be flipped horizontally. Defaults\n * to false.\n */\nexport function drawMask(\n  canvas: Canvas, image: ImageType, maskImage: ImageData|null,\n  maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false) {\n  const [height, width] = getInputSize(image);\n  canvas.width = width;\n  canvas.height = height;\n  const ctx = canvas.getContext('2d');\n  ctx.save();\n  if (flipHorizontal) {\n    flipCanvasHorizontal(canvas);\n  }\n  ctx.drawImage(image, 0, 0);\n  ctx.globalAlpha = maskOpacity;\n  if (maskImage) {\n    assertSameDimensions({width, height}, maskImage, 'image', 'mask');\n    const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n    const blurredMask =

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drawAndBlurImageOnOffScreenCanvas(\n    mask, maskBlurAmount, CANVAS_NAMES.blurredMask);\n
ctx.drawImage(blurredMask, 0, 0, width, height);\n } \n ctx.restore();\n}\n\n/**\n * Given an image and a\n
maskImage of type ImageData, draws the image with the\n * pixelated mask on top of it onto a canvas.\n * \n * @param canvas The canvas to be drawn onto.\n * \n * @param image The original image to apply the mask to.\n * \n * @param maskImage An ImageData containing the mask. Ideally this should be\n * generated by\n
toColoredPartMask.\n * \n * @param maskOpacity The opacity of the mask when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n * \n * @param maskBlurAmount How many pixels to blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n * \n * @param flipHorizontal If the result should be flipped horizontally. Defaults\n * to false.\n * \n * @param pixelCellWidth The width of each pixel cell. Default to 10 px.\n */\n\nexport function drawPixelatedMask(\n    canvas: Canvas, image: ImageType,\n    maskImage: ImageData,\n    maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false,\n    pixelCellWidth = 10.0) {\n    const [height, width] = getInputSize(image);\n    assertSameDimensions({ width, height }, maskImage,\n    'image', 'mask');\n    const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n    const blurredMask = drawAndBlurImageOnOffScreenCanvas(\n        mask, maskBlurAmount,\n        CANVAS_NAMES.blurredMask);\n    canvas.width = blurredMask.width;\n    canvas.height = blurredMask.height;\n    const ctx = canvas.getContext('2d');\n    ctx.save();\n    if (flipHorizontal) {\n        flipCanvasHorizontal(canvas);\n    }\n    const offscreenCanvas =\n    ensureOffscreenCanvasCreated(CANVAS_NAMES.lowresPartMask);\n    const offscreenCanvasCtx =\n    offscreenCanvas.getContext('2d');\n    offscreenCanvas.width = blurredMask.width * (1.0 / pixelCellWidth);\n    offscreenCanvas.height = blurredMask.height * (1.0 / pixelCellWidth);\n    offscreenCanvasCtx.drawImage(\n        blurredMask, 0, 0, blurredMask.width, blurredMask.height, 0, 0,\n        offscreenCanvas.width,\n        offscreenCanvas.height);\n    ctx.imageSmoothingEnabled = false;\n    ctx.drawImage(\n        offscreenCanvas, 0, 0,\n        offscreenCanvas.width, offscreenCanvas.height, 0,\n        0, canvas.width, canvas.height);\n    // Draws vertical grid lines that are `pixelCellWidth` apart from each other.\n    for (let i = 0; i < offscreenCanvas.width; i++) {\n        ctx.beginPath();\n        ctx.strokeStyle = '#ffffff';\n        ctx.moveTo(pixelCellWidth * i, 0);\n        ctx.lineTo(pixelCellWidth * i, canvas.height);\n        ctx.stroke();\n    }\n    // Draws horizontal grid lines that are `pixelCellWidth` apart from each\n    // other.\n    for (let i = 0; i < offscreenCanvas.height; i++) {\n        ctx.beginPath();\n        ctx.strokeStyle = '#ffffff';\n        ctx.moveTo(0, pixelCellWidth * i);\n        ctx.lineTo(canvas.width, pixelCellWidth * i);\n        ctx.stroke();\n    }\n    ctx.globalAlpha = 1.0 - maskOpacity;\n    ctx.drawImage(image, 0, 0, blurredMask.width, blurredMask.height);\n    ctx.restore();\n}\n\nfunction createPersonMask(\n    multiPersonSegmentation: PersonSegmentation[] | SemanticPersonSegmentation,\n    edgeBlurAmount: number): Canvas {\n    const backgroundMaskImage = toMask(\n        multiPersonSegmentation, { r: 0, g: 0, b: 0, a: 255 },\n        { r: 0, g: 0, b: 0, a: 0 });\n    const backgroundMask =\n        renderImageDataToOffScreenCanvas(backgroundMaskImage, CANVAS_NAMES.mask);\n    if (edgeBlurAmount === 0) {\n        return backgroundMask;\n    } else {\n        return drawAndBlurImageOnOffScreenCanvas(\n            backgroundMask, edgeBlurAmount, CANVAS_NAMES.blurredMask);\n    }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image with its background\n * blurred onto the canvas.\n * \n * @param canvas The canvas to draw the background-blurred image onto.\n * \n * @param image The image to blur the background of and draw.\n * \n * @param personSegmentation A SemanticPersonSegmentation or an array of\n * PersonSegmentation object.\n * \n * @param backgroundBlurAmount How many pixels in the background blend into each\n * other. Defaults to 3. Should be an integer between 1 and 20.\n * \n * @param edgeBlurAmount How many pixels to blur on the edge between the person\n * and the background by. Defaults to 3. Should be an integer between 0 and 20.\n * \n * @param flipHorizontal If the output should be flipped horizontally. Defaults\n * to false.\n */\n\nexport function drawBokehEffect(\n    canvas: Canvas, image: ImageType,\n    multiPersonSegmentation: SemanticPersonSegmentation | PersonSegmentation[],\n    backgroundBlurAmount = 3, edgeBlurAmount = 3, flipHorizontal = false) {\n    const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n        image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n    canvas.width = blurredImage.width;\n    canvas.height = blurredImage.height;\n    const ctx = canvas.getContext('2d');\n    if (Array.isArray(multiPersonSegmentation)

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&&\n  multiPersonSegmentation.length === 0) {\n  ctx.drawImage(blurredImage, 0, 0);\n  return;\n }\n\nconst personMask = createPersonMask(multiPersonSegmentation, edgeBlurAmount);\n\n ctx.save();\n if
(flipHorizontal) {\n  flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const
[height, width] = getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n // \"destination-in\" - \"The
existing canvas content is kept where both the\n // new shape and existing canvas content overlap. Everything else
is made\n // transparent.\"\n // crop what's not the person using the mask from the original image\n
drawWithCompositing(ctx, personMask, 'destination-in');\n // \"destination-over\" - \"The existing canvas content is
kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n // draw the blurred background on top of the original image where it doesn't\n // overlap.\n
drawWithCompositing(ctx, blurredImage, 'destination-over');\n ctx.restore();\n }\n\nfunction
createBodyPartMask(\n  multiPersonPartSegmentation: SemanticPartSegmentation|PartSegmentation[],\n
bodyPartIdsToMask: number[], edgeBlurAmount: number): Canvas {\n  const backgroundMaskImage = toMask(\n
  multiPersonPartSegmentation, {r: 0, g: 0, b: 0, a: 0},\n    {r: 0, g: 0, b: 0, a: 255}, true, bodyPartIdsToMask);\n\n
const backgroundMask =\n  renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n  if (edgeBlurAmount === 0) {\n  return backgroundMask;\n } else {\n  return
drawAndBlurImageOnOffScreenCanvas(\n    backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n * @param canvas The canvas to draw the background-blurred
image onto.\n * @param image The image to blur the background of and draw.\n * @param
partSegmentation A SemanticPartSegmentation or an array of\n * PartSegmentation object.\n * @param
bodyPartIdsToBlur Default to [0, 1] (left-face and right-face). An\n * array of body part ids to blur. Each must be
one of the 24 body part ids.\n * @param backgroundBlurAmount How many pixels in the background blend into
each\n * other. Defaults to 3. Should be an integer between 1 and 20.\n * @param edgeBlurAmount How many
pixels to blur on the edge between the person\n * and the background by. Defaults to 3. Should be an integer
between 0 and 20.\n * @param flipHorizontal If the output should be flipped horizontally. Defaults\n * to
false.\n */\nexport function blurBodyPart(\n  canvas: Canvas, image: ImageType,\n  partSegmentation:
SemanticPartSegmentation|PartSegmentation[],\n  bodyPartIdsToBlur = [0, 1], backgroundBlurAmount = 3,
edgeBlurAmount = 3,\n  flipHorizontal = false) {\n  const blurredImage =
drawAndBlurImageOnOffScreenCanvas(\n    image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n\n  canvas.width = blurredImage.width;\n  canvas.height = blurredImage.height;\n\n  const ctx =
canvas.getContext('2d');\n  if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n
ctx.drawImage(blurredImage, 0, 0);\n  return;\n }\n  const bodyPartMask =\n  createBodyPartMask(partSegmentation, bodyPartIdsToBlur, edgeBlurAmount);\n\n  ctx.save();\n  if (flipHorizontal)
{\n  flipCanvasHorizontal(canvas);\n }\n  // draw the original image on the final canvas\n  const [height, width] =
getInputSize(image);\n  ctx.drawImage(image, 0, 0, width, height);\n\n  // \"destination-in\" - \"The existing canvas
content is kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n  // crop what's not the person using the mask from the original image\n  drawWithCompositing(ctx,
bodyPartMask, 'destination-in');\n  // \"destination-over\" - \"The existing canvas content is kept where both the\n //
new shape and existing canvas content overlap. Everything else is made\n // transparent.\"\n  // draw the blurred
background on top of the original image where it doesn't\n // overlap.\n  drawWithCompositing(ctx, blurredImage,
'destination-over');\n  ctx.restore();\n }\n\n\"**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\n\n// method copied from bGlur in https://codepen.io/zhaojun/pen/zZmRQe\nexport function cpuBlur(\n  canvas: HTMLCanvasElement|OffscreenCanvas,\n  image: HTMLImageElement|HTMLVideoElement|HTMLCanvasElement|OffscreenCanvas,\n  blur: number) {\n  const ctx = canvas.getContext('2d');\n  let sum = 0;\n  const delta = 5;\n  const alphaLeft = 1 / (2 * Math.PI * delta * delta);\n  const step = blur < 3 ? 1 : 2;\n  for (let y = -blur; y <= blur; y += step) {\n    for (let x = -blur; x <= blur; x += step) {\n      const weight =\n        alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta));\n      sum += weight;\n    }\n  }\n  for (let y = -blur; y <= blur; y += step) {\n    for (let x = -blur; x <= blur; x += step) {\n      ctx.globalAlpha = alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta)) / sum * blur;\n      ctx.drawImage(image, x, y);\n    }\n  }\n  ctx.globalAlpha = 1;\n}\n\n/*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\nexport const PART_CHANNELS: string[] = [\n  'left_face',\n  'right_face',\n  'left_upper_arm_front',\n  'left_upper_arm_back',\n  'right_upper_arm_front',\n  'right_upper_arm_back',\n  'left_lower_arm_front',\n  'left_lower_arm_back',\n  'right_lower_arm_front',\n  'right_lower_arm_back',\n  'left_hand',\n  'right_hand',\n  'torso_front',\n  'torso_back',\n  'left_upper_leg_front',\n  'left_upper_leg_back',\n  'right_upper_leg_front',\n  'right_upper_leg_back',\n  'left_lower_leg_front',\n  'left_lower_leg_back',\n  'right_lower_leg_front',\n  'right_lower_leg_back',\n  'left_feet',\n  'right_feet'];\n\n/*\n * @license See the LICENSE file.\n */\n\n// This code is auto-generated, do not modify this file!\nconst version = '2.2.0';\nexport {\n  version,\n  names: [\n    'toFlattenedOneHotPartMap',\n    'partHeatmapScores',\n    'numParts',\n    'shape',\n    'partMapLocations',\n    'tf.argmax',\n    'partMapFlattened',\n    'tf.reshape',\n    'tf.oneHot',\n    'toMaskTensor',\n    'segmentScores',\n    'threshold',\n    'tf.tidy',\n    'tf.cast',\n    'tf.greater',\n    'tf.scalar',\n    'decodePartSegmentation',\n    'segmentationMask',\n    '_a',\n    'partMapHeight',\n    'partMapWidth',\n    'image',\n    'mask',\n    'flattenedMap',\n    'partNumbers',\n    'tf.expandDims',\n    'tf.range',\n    'tf.matmul',\n    'partMap',\n    'partMapShiftedUpForClipping',\n    'tf.add',\n    'tf.sub',\n    'tf.mul',\n    'model',\n    'outputStride',\n    'this',\n    'inputShape',\n    'inputs',\n    'tf.util',\n    'assert',\n    'BaseModel',\n    'input',\n    'asFloat',\n    '_this',\n    'preprocessInput',\n    'asBatch',\n    'results3d',\n    'predict',\n    'map',\n    'y',\n    'tf.squeeze',\n    'namedResults',\n    'nameOutputResults',\n    'heatmapScores',\n    'tf.sigmoid',\n    'heatmap',\n    'offsets',\n    'displacementFwd',\n    'displacementBwd',\n    'segmentation',\n    'partHeatmaps',\n    'longOffsets',\n    'partOffsets',\n    'dispose',\n    '__extends',\n    'MobileNet',\n    'tf.div',\n    'results',\n    'PART_NAMES',\n    'NUM_KEYPOINTS',\n    'length',\n    'PART_IDS',\n    'reduce',\n    'result',\n    'jointName',\n    'i',\n    'jointNameA',\n    'jointNameB',\n    'getScale',\n    '_b',\n    'padding',\n    'height',\n    'width',\n    'inputResolutionY',\n    'inputResolutionX',\n    'padT',\n    'padB',\n    'getOffsetPoint',\n    'x',\n    'keypoint',\n    'get',\n    'getImageCoords',\n    'part',\n    'heatmapX',\n    'heatmapY',\n    'clamp',\n    'a',\n    'min',\n    'max',\n    'addVectors',\n    'b',\n    'computeDistance',\n    'embedding',\n    'pose',\n    'minPartScore',\n    'distance',\n    'numKpt',\n    'p',\n    'keypoints',\n    'score',\n    'Math',\n    'position',\n    'Infinity',\n    'getEmbedding',\n    'location',\n    'keypointIndex',\n    'convertToPosition',\n    'outputResolutionX',\n    'refineSteps',\n    'newLocation',\n    'nn',\n    'dy',\n    'dx',\n    't',\n    'newPos',\n    'nn_1',\n    'matchEmbeddingToInstance',\n    'poses',\n    'numKptForMatching',\n    '_c',\n    'stride',\n    'padL',\n    'scaleX',\n    'scaleY',\n    'embed',\n    'pair',\n    'round',\n    'convertToPositionInOutput',\n    'keypointsIndex',\n    'push',\n    'kMin',\n    'kMinDist',\n    'k',\n    'dist',\n    'getOutputResolution',\n    'decodeMultipleMasksWebGL',\n    'posesAboveScore',\n    'minKptScore',\n    'maxNumPeople',\n    'inHeight',\n    'inWidth',\n    'origHeight',\n    'origWidth',\n    'slice',\n    'outHeight',\n    'outWidth',\n    'shapedLongOffsets',\n    'poseVals',\n    'Float32Array',\n    'fill',\n    'poseOffset',\n    'kp',\n    'offset',\n    '_d',\n    'posesTensor',\n    'tf.tensor',\n    'program',\n    'variableNames',\n    'outputShape',\n    'userCode',\n    'tf.backend',\n    'compileAndRun',\n    'isWebGLBackend',\n    'getBackend',\n    'decodePersonInstanceMasks',\n    'minPoseScore',\n    'minKeypointScore',\n    'filter',\n    'personSegmentations',\n    'masksTensorInfo',\n    'masksTensor',\n    'tf.engine',\n    'makeTensorFromDataId',\n    'dataId',\n    'dtype',\n    '_',\n    'tf.equal',\n    'toPersonKSegmentation',\n    'Promise',\n    'all',\n    'data',\n    'personSegmentationsData',\n    'forEach',\n    'segmentationsData',\n    'longOffsetsData',\n    'dataArray',\n    'Uint8Array',\n    'j',\n    'n',\n    'decodeMultipleMasksCPU',\n    'decodePersonInstancePartMasks',\n    'partSegmentation',\n    'partSegmentations',\n    'bodyParts',\n    'toPersonKPartSegmentation',\n    'partSegmentationsByPersonData',\n    'partSegmentationData',\n    'partSegmentation',\n    'Int32Array',\n    'decodeMultiplePartMasksCPU',\n    'half',\n    'floor',\n    'maxSize',\n    'get
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No license file was found, but licenses were detected in source scan.

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```



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tf.sigmoid(namedResults.heatmap),\n      offsets: namedResults.offsets,\n      displacementFwd:\n      namedResults.displacementFwd,\n      displacementBwd: namedResults.displacementBwd,\n      segmentation:\n      namedResults.segmentation,\n      partHeatmaps: namedResults.partHeatmaps,\n      longOffsets:\n      namedResults.longOffsets,\n      partOffsets: namedResults.partOffsets\n    });\n  }\n\n  // Because\n  // MobileNet and ResNet predict() methods output a different order for\n  // these values, we have a method that needs\n  // to be implemented to order them.\n  abstract nameOutputResults(results: tf.Tensor3D[]): {\n    heatmap:\n    tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n    segmentation: tf.Tensor3D,\n    partHeatmaps: tf.Tensor3D,\n    longOffsets: tf.Tensor3D,\n    partOffsets:\n    tf.Tensor3D\n  };\n\n  /**\n   * Releases the CPU and GPU memory allocated by the model.\n   */\n  dispose() {\n    this.model.dispose();\n  }\n}\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport { BaseModel } from './base_model';\nexport class\nMobileNet extends BaseModel {\n  preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n    // Normalize the pixels\n    // [0, 255] to be between [-1, 1].\n    return tf.tidy(() => tf.sub(tf.div(input, 127.5), 1.0));\n  }\n\n  nameOutputResults(results: tf.Tensor3D[]) {\n    const [\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets,\n    ] = results;\n    return {\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets\n    };\n  }\n}\n\n"/**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\n\nexport type Tuple<T> = [T, T];\nexport type StringTuple = Tuple<string>;\nexport type NumberTuple =\nTuple<number>;\nexport const PART_NAMES = [\n  'nose', 'leftEye', 'rightEye', 'leftEar', 'rightEar',\n  'leftShoulder',\n  'rightShoulder', 'leftElbow', 'rightElbow', 'leftWrist', 'rightWrist',\n  'leftHip', 'rightHip', 'leftKnee',\n  'rightKnee', 'leftAnkle', 'rightAnkle'\n];\nexport const NUM_KEYPOINTS = PART_NAMES.length;\nexport\ninterface NumberDict {\n  [jointName: string]: number;\n}\nexport const PART_IDS =\nPART_NAMES.reduce((result: NumberDict, jointName, i): NumberDict => {\n  result[jointName] = i;\n  return result;\n}, {});\nconst CONNECTED_PART_NAMES: StringTuple[] = [\n  ['leftHip', 'leftShoulder'],\n  ['leftElbow', 'leftShoulder'],\n  ['leftElbow', 'leftWrist'],\n  ['leftHip', 'leftKnee'],\n  ['leftKnee', 'leftAnkle'],\n  ['rightHip',\n  'rightShoulder'],\n  ['rightElbow', 'rightShoulder'],\n  ['rightElbow', 'rightWrist'],\n  ['rightHip', 'rightKnee'],\n  ['rightKnee', 'rightAnkle'],\n  ['leftShoulder', 'rightShoulder'],\n  ['leftHip', 'rightHip']\n];\n\n/* Define the skeleton.\nThis defines the parent->child relationships of our\n * tree. Arbitrarily this defines the nose as the root of the tree,\nhowever\n * since we will infer the displacement for both parent->child and\n * child->parent, we can define the\n * tree root as any node.\n */\nexport const POSE_CHAIN: StringTuple[] = [\n  ['nose', 'leftEye'],\n  ['leftEye', 'leftEar'],\n  ['nose', 'rightEye'],\n  ['rightEye', 'rightEar'],\n  ['nose', 'leftShoulder'],\n  ['leftShoulder', 'leftElbow'],\n  ['leftElbow',\n  'leftWrist'],\n  ['leftShoulder', 'leftHip'],\n  ['leftHip', 'leftKnee'],\n  ['leftKnee', 'leftAnkle'],\n  ['nose', 'rightShoulder'],\n  ['rightShoulder', 'rightElbow'],\n  ['rightElbow', 'rightWrist'],\n  ['rightShoulder', 'rightHip'],\n  ['rightHip', 'rightKnee'],\n  ['rightKnee', 'rightAnkle']\n];\nexport const CONNECTED_PART_INDICES =

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CONNECTED_PART_NAMES.map(\n ([jointNameA, jointNameB]) =>\n ([PART_IDS[jointNameA], PART_IDS[jointNameB]]));\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Part, TensorBuffer3D, Vector2D} from './types';\n\nexport function getScale(\n  [height, width]: [number, number],\n  [inputResolutionY, inputResolutionX]: [number, number],\n  padding: Padding): [number, number] {\n  const {top: padT, bottom: padB, left: padL, right: padR} = padding;\n  const scaleY = inputResolutionY / (padT + padB + height);\n  const scaleX = inputResolutionX / (padL + padR + width);\n  return [scaleX, scaleY];\n}\n\nexport function getOffsetPoint(\n  y: number, x: number, keypoint: number, offsets: TensorBuffer3D): Vector2D {\n  return {\n    y: offsets.get(y, x, keypoint),\n    x: offsets.get(y, x, keypoint + NUM_KEYPOINTS)\n  };\n}\n\nexport function getImageCoords(\n  part: Part, outputStride: number, offsets: TensorBuffer3D): Vector2D {\n  const {heatmapY, heatmapX, id: keypoint} = part;\n  const {y, x} = getOffsetPoint(heatmapY, heatmapX, keypoint, offsets);\n  return {\n    x: part.heatmapX * outputStride + x,\n    y: part.heatmapY * outputStride + y\n  };\n}\n\nexport function fillArray<T>(element: T, size: number): T[] {\n  const result: T[] = new Array(size);\n  for (let i = 0; i < size; i++) {\n    result[i] = element;\n  }\n  return result;\n}\n\nexport function clamp(a: number, min: number, max: number): number {\n  if (a < min) {\n    return min;\n  }\n  if (a > max) {\n    return max;\n  }\n  return a;\n}\n\nexport function squaredDistance(\n  y1: number, x1: number, y2: number, x2: number): number {\n  const dy = y2 - y1;\n  const dx = x2 - x1;\n  return dy * dy + dx * dx;\n}\n\nexport function addVectors(a: Vector2D, b: Vector2D): Vector2D {\n  return {x: a.x + b.x, y: a.y + b.y};\n}\n\nexport function clampVector(a: Vector2D, min: number, max: number): Vector2D {\n  return {y: clamp(a.y, min, max), x: clamp(a.x, min, max)};\n}\n", "/*\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\nimport {getScale} from './util';\n\ninterface Pair {\n  x: number;\n  y: number;\n}\n\nfunction computeDistance(embedding: Pair[], pose: Pose, minPartScore = 0.3) {\n  let distance = 0.0;\n  let numKpt = 0;\n  for (let p = 0; p < embedding.length; p++) {\n    if (pose.keypoints[p].score > minPartScore) {\n      numKpt += 1;\n      distance += (embedding[p].x - pose.keypoints[p].position.x) ** 2 +\n        (embedding[p].y - pose.keypoints[p].position.y) ** 2;\n    }\n  }\n  if (numKpt === 0) {\n    distance = Infinity;\n  } else {\n    distance = distance / numKpt;\n  }\n  return distance;\n}\n\nfunction convertToPositionInOutput(\n  position: Pair, [padT, padL]: [number, number],\n  [scaleX, scaleY]: [number, number], stride: number): Pair {\n  const y = Math.round(((padT + position.y + 1.0) * scaleY - 1.0) / stride);\n  const x = Math.round(((padL + position.x + 1.0) * scaleX - 1.0) / stride);\n  return {x, y};\n}\n\nfunction getEmbedding(\n  location: Pair, keypointIndex: number, convertToPosition: (pair: Pair) => Pair, outputResolutionX: number, longOffsets: Float32Array, refineSteps: number, [height, width]: [number, number]): Pair {\n  const newLocation = convertToPosition(location);\n  const nn = newLocation.y * outputResolutionX + newLocation.x;\n  let dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n  let dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n  let y = location.y + dy;\n  let x = location.x + dx;\n  for (let t = 0; t < refineSteps; t++) {\n    y = Math.min(y, height - 1);\n    x = Math.min(x, width -
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1);\n  const newPos = convertToPosition({x, y});\n  const nn = newPos.y * outputResolutionX + newPos.x;\n  dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n  dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n  y = y + dy;\n  x = x + dx;\n  }\n  return {x, y};\n}\n\nfunction\nmatchEmbeddingToInstance(\n  location: Pair, longOffsets: Float32Array, poses: Pose[],\n  numKptForMatching:\n  number, [padT, padL]: [number, number],\n  [scaleX, scaleY]: [number, number], outputResolutionX: number,\n  [height, width]: [number, number], stride: number,\n  refineSteps: number): number {\n  const embed: Pair[] = [];\n  const convertToPosition = (pair: Pair) =>\n    convertToPositionInOuput(pair, [padT, padL], [scaleX, scaleY],\n    stride);\n  for (let keypointsIndex = 0; keypointsIndex < numKptForMatching;\n    keypointsIndex++) {\n    const embedding = getEmbedding(\n      location, keypointsIndex, convertToPosition, outputResolutionX,\n      longOffsets, refineSteps, [height, width]);\n    embed.push(embedding);\n  }\n  let kMin = -1;\n  let kMinDist =\n  Infinity;\n  for (let k = 0; k < poses.length; k++) {\n    const dist = computeDistance(embed, poses[k]);\n    if (dist <\n    kMinDist) {\n      kMin = k;\n      kMinDist = dist;\n    }\n  }\n  return kMin;\n}\n\nfunction getOutputResolution(\n  [inputResolutionY, inputResolutionX]: [number, number],\n  stride: number): [number, number] {\n  const\n  outputResolutionX = Math.round((inputResolutionX - 1.0) / stride + 1.0);\n  const outputResolutionY =\n  Math.round((inputResolutionY - 1.0) / stride + 1.0);\n  return [outputResolutionX, outputResolutionY];\n}\n\nexport\nfunction decodeMultipleMasksCPU(\n  segmentation: Uint8Array, longOffsets: Float32Array,\n  posesAboveScore: Pose[], height: number, width: number, stride: number,\n  [inHeight, inWidth]: [number,\n  number], padding: Padding,\n  refineSteps: number, numKptForMatching = 5): Uint8Array[] {\n  const dataArray\n  s =\n  posesAboveScore.map(x => new Uint8Array(height * width).fill(0));\n  const {top: padT, left: padL} =\n  padding;\n  const [scaleX, scaleY] =\n  getScale([height, width], [inHeight, inWidth], padding);\n  const\n  [outputResolutionX, ] =\n  getOutputResolution([inHeight, inWidth], stride);\n  for (let i = 0; i < height; i += 1) {\n    for (let j = 0; j < width; j += 1) {\n      const n = i * width + j;\n      const prob = segmentation[n];\n      if (prob ===\n      1) {\n        const kMin = matchEmbeddingToInstance(\n          {x: j, y: i}, longOffsets, posesAboveScore,\n          numKptForMatching,\n          [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n          stride,\n          refineSteps);\n        if (kMin >= 0) {\n          dataArray\n          s[kMin][n] = 1;\n        }\n      }\n    }\n  }\n  return\n  dataArray\n  s;\n}\n\nexport\nfunction decodeMultiplePartMasksCPU(\n  segmentation: Uint8Array, longOffsets:\n  Float32Array,\n  partSegmentaion: Uint8Array, posesAboveScore: Pose[], height: number,\n  width: number,\n  stride: number, [inHeight, inWidth]: [number, number],\n  padding: Padding, refineSteps: number,\n  numKptForMatching = 5): Int32Array[] {\n  const dataArray\n  s =\n  posesAboveScore.map(x => new\n  Int32Array(height * width).fill(-1));\n  const {top: padT, left: padL} = padding;\n  const [scaleX, scaleY] =\n  getScale([height, width], [inHeight, inWidth], padding);\n  const [outputResolutionX, ] =\n  getOutputResolution([inHeight, inWidth], stride);\n  for (let i = 0; i < height; i += 1) {\n    for (let j = 0; j < width; j\n    += 1) {\n      const n = i * width + j;\n      const prob = segmentation[n];\n      if (prob === 1) {\n        const kMin =\n        matchEmbeddingToInstance(\n          {x: j, y: i}, longOffsets, posesAboveScore, numKptForMatching,\n          [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n          stride, refineSteps);\n        if (kMin >=\n        0) {\n          dataArray\n          s[kMin][n] = partSegmentaion[n];\n        }\n      }\n    }\n  }\n  return\n  dataArray\n  s;\n}\n\n",/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the\n  Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n  on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n  limitations under the\n  License.\n *  
=====\n*\n*\nimport * as tf from '@tensorflow/tfjs-core';\nimport * as tf_webgl from '@tensorflow/tfjs-backend-\nwebgl';\nimport {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Pose} from '../types';\nimport\n{getScale} from './util';\nexport\nfunction decodeMultipleMasksWebGL(\n  segmentation: tf.Tensor2D,\n  longOffsets: tf.Tensor3D,\n  posesAboveScore: Pose[], height: number, width: number, stride: number,\n
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[inHeight, inWidth]: [number, number], padding: Padding,\n  refineSteps: number, minKptScore: number,\n  maxNumPeople: number): tf.TensorInfo {\n // The height/width of the image/canvas itself.\n const [origHeight,\n origWidth] = segmentation.shape;\n // The height/width of the output of the model.\n const [outHeight, outWidth]\n = longOffsets.shape.slice(0, 2);\n\n const shapedLongOffsets: tf.Tensor4D =\n   tf.reshape(longOffsets,\n [outHeight, outWidth, 2, NUM_KEYPOINTS]);\n\n // Make pose tensor of shape [MAX_NUM_PEOPLE,\n NUM_KEYPOINTS, 3] where\n // the last 3 coordinates correspond to the score, h and w coordinate of that\n // keypoint.\n const poseVals = new Float32Array(maxNumPeople * NUM_KEYPOINTS * 3).fill(0.0);\n for (let i =\n 0; i < posesAboveScore.length; i++) {\n   const poseOffset = i * NUM_KEYPOINTS * 3;\n   const pose =\n posesAboveScore[i];\n   for (let kp = 0; kp < NUM_KEYPOINTS; kp++) {\n     const keypoint =\n pose.keypoints[kp];\n     const offset = poseOffset + kp * 3;\n     poseVals[offset] = keypoint.score;\n     poseVals[offset + 1] = keypoint.position.y;\n     poseVals[offset + 2] = keypoint.position.x;\n   }\n }\n\n const\n [scaleX, scaleY] =\n   getScale([height, width], [inHeight, inWidth], padding);\n\n const posesTensor =\n tf.tensor(poseVals, [maxNumPeople, NUM_KEYPOINTS, 3]);\n\n const {top: padT, left: padL} = padding;\n\n const program: tf_webgl.GPGPUProgram = {\n   variableNames: ['segmentation', 'longOffsets', 'poses'],\n   outputShape: [origHeight, origWidth],\n   userCode: `\n int convertToPositionInOut(int pos, int pad, float\n scale, int stride) {\n   return round(((float(pos + pad) + 1.0) * scale - 1.0) / float(stride));\n }\n\n float\n convertToPositionInOutFloat(\n   int pos, int pad, float scale, int stride) {\n   return ((float(pos + pad) + 1.0)\n * scale - 1.0) / float(stride);\n }\n\n float dist(float x1, float y1, float x2, float y2) {\n   return pow(x1 - x2, 2.0)\n + pow(y1 - y2, 2.0);\n }\n\n float sampleLongOffsets(float h, float w, int d, int k) {\n   float fh = fract(h);\n   float fw = fract(w);\n   int clH = int(ceil(h));\n   int clW = int(ceil(w));\n   int flH = int(floor(h));\n   int flW =\n int(floor(w));\n   float o11 = getLongOffsets(flH, flW, d, k);\n   float o12 = getLongOffsets(flH, clW, d, k);\n   float o21 = getLongOffsets(clH, flW, d, k);\n   float o22 = getLongOffsets(clH, clW, d, k);\n   float o1 =\n mix(o11, o12, fw);\n   float o2 = mix(o21, o22, fw);\n   return mix(o1, o2, fh);\n }\n\n int\n findNearestPose(int h, int w) {\n   float prob = getSegmentation(h, w);\n   if (prob < 1.0) {\n     return -1;\n   }\n\n   // Done(Tyler): convert from output space h/w to strided space.\n   float stridedH =\n convertToPositionInOutFloat(\n   h, ${padT}, ${scaleY}, ${stride});\n   float stridedW =\n convertToPositionInOutFloat(\n   w, ${padL}, ${scaleX}, ${stride});\n\n   float minDist = 1000000.0;\n   int iMin = -1;\n   for (int i = 0; i < ${maxNumPeople}; i++) {\n     float curDistSum = 0.0;\n     int numKpt =\n 0;\n     for (int k = 0; k < ${NUM_KEYPOINTS}; k++) {\n       float dy = sampleLongOffsets(stridedH,\n stridedW, 0, k);\n       float dx = sampleLongOffsets(stridedH, stridedW, 1, k);\n\n       float y = float(h) + dy;\n       float x = float(w) + dx;\n\n       for (int s = 0; s < ${refineSteps}; s++) {\n         int yRounded = round(min(y,\n float(${height} - 1.0));\n         int xRounded = round(min(x, float(${width} - 1.0)));\n\n         float yStrided =\n convertToPositionInOutFloat(\n         yRounded, ${padT}, ${scaleY}, ${stride});\n         float xStrided =\n convertToPositionInOutFloat(\n         xRounded, ${padL}, ${scaleX}, ${stride});\n\n         float dy =\n sampleLongOffsets(yStrided, xStrided, 0, k);\n         float dx = sampleLongOffsets(yStrided, xStrided, 1, k);\n\n         y = y + dy;\n         x = x + dx;\n       }\n\n       float poseScore = getPoses(i, k, 0);\n       float poseY =\n getPoses(i, k, 1);\n       float poseX = getPoses(i, k, 2);\n       if (poseScore > ${minKptScore}) {\n         numKpt = numKpt + 1;\n         curDistSum = curDistSum + dist(x, y, poseX, poseY);\n       }\n     }\n     if\n (numKpt > 0 && curDistSum / float(numKpt) < minDist) {\n       minDist = curDistSum / float(numKpt);\n       iMin = i;\n     }\n   }\n   return iMin;\n }\n\n void main() {\n   ivec2 coords = getOutputCoords();\n   int nearestPose = findNearestPose(coords[0], coords[1]);\n   setOutput(float(nearestPose));\n }\n\n const webglBackend = tf.backend() as tf_webgl.MathBackendWebGL;\n return webglBackend.compileAndRun(\n   program, [segmentation, shapedLongOffsets, posesTensor]);\n\n"}`*\n * @license\n * Copyright 2019 Google\n Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *  

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=====\n\n*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport { getBackend } from '@tensorflow/tfjs-core';\nimport { Padding, PartSegmentation, PersonSegmentation, Pose } from './types';\nimport { decodeMultipleMasksCPU, decodeMultiplePartMasksCPU } from './decode_multiple_masks_cpu';\nimport { decodeMultipleMasksWebGL } from './decode_multiple_masks_webgl';\n\nexport function toPersonKSegmentation(\n  segmentation: tf.Tensor2D, k: number): tf.Tensor2D {\n  return tf.tidy(() => (tf.cast(tf.equal(segmentation, tf.scalar(k)), 'int32') as tf.Tensor2D));\n}\n\nexport function toPersonKPartSegmentation(\n  segmentation: tf.Tensor2D, bodyParts: tf.Tensor2D, k: number): tf.Tensor2D {\n  return tf.tidy(() => tf.sub(tf.mul(tf.cast(tf.equal(segmentation, tf.scalar(k)), 'int32'), tf.add(bodyParts, 1)), 1));\n}\n\nfunction isWebGLBackend() {\n  return getBackend() === 'webgl';\n}\n\nexport async function decodePersonInstanceMasks(\n  segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D, poses: Pose[],\n  height: number, width: number, stride: number, [inHeight, inWidth]: [number, number], padding: Padding, minPoseScore = 0.2,\n  refineSteps = 8, minKeypointScore = 0.3, maxNumPeople = 10): Promise<PersonSegmentation[]> {\n  // Filter out poses with smaller score.\n  const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n  let personSegmentationsData: Uint8Array[];\n  if (isWebGLBackend()) {\n    const personSegmentations = tf.tidy(() => {\n      const masksTensorInfo = decodeMultipleMasksWebGL(\n        segmentation, longOffsets, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps, minKeypointScore, maxNumPeople);\n      const masksTensor = tf.engine().makeTensorFromDataId(\n        masksTensorInfo.dataId, masksTensorInfo.shape, masksTensorInfo.dtype) as tf.Tensor2D;\n      return posesAboveScore.map((_, k) => toPersonKSegmentation(masksTensor, k));\n    });\n    personSegmentationsData = (await Promise.all(personSegmentations.map(mask => mask.data()))) as Uint8Array[];\n  } else {\n    const segmentationsData = await segmentation.data() as Uint8Array;\n    const longOffsetsData = await longOffsets.data() as Float32Array;\n    personSegmentationsData = decodeMultipleMasksCPU(\n      segmentationsData, longOffsetsData, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps);\n  }\n  return personSegmentationsData.map((data, i) => ({data, pose: posesAboveScore[i], width, height}));\n}\n\nexport async function decodePersonInstancePartMasks(\n  segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D, partSegmentation: tf.Tensor2D, poses: Pose[],\n  height: number, width: number, stride: number, [inHeight, inWidth]: [number, number], padding: Padding,\n  minPoseScore = 0.2, refineSteps = 8, minKeypointScore = 0.3, maxNumPeople = 10): Promise<PartSegmentation[]> {\n  const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n  let partSegmentationsByPersonData: Int32Array[];\n  if (isWebGLBackend()) {\n    const partSegmentations = tf.tidy(() => {\n      const masksTensorInfo = decodeMultipleMasksWebGL(\n        segmentation, longOffsets, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps, minKeypointScore, maxNumPeople);\n      const masksTensor = tf.engine().makeTensorFromDataId(\n        masksTensorInfo.dataId, masksTensorInfo.shape, masksTensorInfo.dtype) as tf.Tensor2D;\n      return posesAboveScore.map((_, k) => toPersonKPartSegmentation(masksTensor, partSegmentation, k));\n    });\n    partSegmentationsByPersonData = (await Promise.all(partSegmentations.map(x => x.data()))) as Int32Array[];\n  } else {\n    const segmentationsData = await segmentation.data() as Uint8Array;\n    const longOffsetsData = await longOffsets.data() as Float32Array;\n    const partSegmentaionData = await partSegmentation.data() as Uint8Array;\n    partSegmentationsByPersonData = decodeMultiplePartMasksCPU(\n      segmentationsData, longOffsetsData, partSegmentaionData, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps);\n  }\n  return partSegmentationsByPersonData.map((data, k) => ({pose: posesAboveScore[k], data, height, width}));\n}\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n */
```

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```
=====
*\n\n// algorithm based on Coursera Lecture from Algorithms, Part 1:\n//
https://www.coursera.org/learn/algorithms-part1/lecture/ZjoSM/heapsort\n\nfunction half(k: number) {\n  return
Math.floor(k / 2);\n}\n\nexport class MaxHeap<T> {\n  private priorityQueue: T[];\n  private numberOfElements:
number;\n  private getElementValue: (element: T) => number;\n\n  constructor(maxSize: number, getElementValue:
(element: T) => number) {\n    this.priorityQueue = new Array(maxSize);\n    this.numberOfElements = -1;\n    this.getElementValue = getElementValue;\n  }\n\n  public enqueue(x: T): void {\n
this.priorityQueue[++this.numberOfElements] = x;\n    this.swim(this.numberOfElements);\n  }\n\n  public
dequeue(): T {\n    const max = this.priorityQueue[0];\n    this.exchange(0, this.numberOfElements--);\n    this.sink(0);\n    this.priorityQueue[this.numberOfElements + 1] = null;\n    return max;\n  }\n\n  public empty():
boolean {\n    return this.numberOfElements === -1;\n  }\n\n  public size(): number {\n    return
this.numberOfElements + 1;\n  }\n\n  public all(): T[] {\n    return this.priorityQueue.slice(0, this.numberOfElements
+ 1);\n  }\n\n  public max(): T {\n    return this.priorityQueue[0];\n  }\n\n  private swim(k: number): void {\n    while
(k > 0 && this.less(half(k), k)) {\n      this.exchange(k, half(k));\n      k = half(k);\n    }\n  }\n\n  private sink(k:
number): void {\n    while (2 * k <= this.numberOfElements) {\n      let j = 2 * k;\n      if (j < this.numberOfElements
&& this.less(j, j + 1)) {\n        j++;\n      }\n      if (!this.less(k, j)) {\n        break;\n      }\n      this.exchange(k, j);\n      k = j;\n    }\n  }\n\n  private getValueAt(i: number): number {\n    return
this.getElementValue(this.priorityQueue[i]);\n  }\n\n  private less(i: number, j: number): boolean {\n    return
this.getValueAt(i) < this.getValueAt(j);\n  }\n\n  private exchange(i: number, j: number): void {\n    const t =
this.priorityQueue[i];\n    this.priorityQueue[i] = this.priorityQueue[j];\n    this.priorityQueue[j] = t;\n  }\n}\n\n", /**\n
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
```

```
*\n\nimport {PartWithScore, TensorBuffer3D} from '../types';\nimport {MaxHeap} from
'./max_heap';\n\nfunction scoreIsMaximumInLocalWindow(\n  keypointId: number, score: number, heatmapY:
number, heatmapX: number,\n  localMaximumRadius: number, scores: TensorBuffer3D): boolean {\n  const
[height, width] = scores.shape;\n\n  let localMaximum = true;\n  const yStart = Math.max(heatmapY -
localMaximumRadius, 0);\n  const yEnd = Math.min(heatmapY + localMaximumRadius + 1, height);\n  for (let
yCurrent = yStart; yCurrent < yEnd; ++yCurrent) {\n    const xStart = Math.max(heatmapX - localMaximumRadius,
0);\n    const xEnd = Math.min(heatmapX + localMaximumRadius + 1, width);\n    for (let xCurrent = xStart;
xCurrent < xEnd; ++xCurrent) {\n      if (scores.get(yCurrent, xCurrent, keypointId) > score) {\n        localMaximum
= false;\n        break;\n      }\n    }\n    if (!localMaximum) {\n      break;\n    }\n  }\n\n  return
localMaximum;\n}\n\n/**\n * Builds a priority queue with part candidate positions for a specific image in\n * the
batch. For this we find all local maxima in the score maps with score\n * values above a threshold. We create a
single priority queue across all parts.\n */\n\nexport function buildPartWithScoreQueue(\n  scoreThreshold: number,
localMaximumRadius: number,\n  scores: TensorBuffer3D): MaxHeap<PartWithScore> {\n  const [height, width,
numKeypoints] = scores.shape;\n\n  const queue = new MaxHeap<PartWithScore>(\n    height * width *
numKeypoints, ({score}) => score);\n\n  for (let heatmapY = 0; heatmapY < height; ++heatmapY) {\n    for (let
heatmapX = 0; heatmapX < width; ++heatmapX) {\n      for (let keypointId = 0; keypointId < numKeypoints;
++keypointId) {\n        const score = scores.get(heatmapY, heatmapX, keypointId);\n\n        // Only consider parts
```

```

with score greater or equal to threshold as\n      // root candidates.\n      if (score < scoreThreshold) {\n
continue;\n      }\n      // Only consider keypoints whose score is maximum in a local window.\n      if
(scoreIsMaximumInLocalWindow(\n          keypointId, score, heatmapY, heatmapX, localMaximumRadius,\n          scores)) {\n          queue.enqueue({score, part: {heatmapY, heatmapX, id: keypointId}});\n      }\n  }\n
}\n\n return queue;\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {NumberTuple, PART_IDS, PART_NAMES, POSE_CHAIN} from './keypoints';\nimport {Keypoint,
PartWithScore, TensorBuffer3D, Vector2D} from './types';\nimport {clamp, getOffsetPoint} from './util';\nimport
{addVectors, getImageCoords} from './util';\n\nconst parentChildrenTuples: NumberTuple[] =
POSE_CHAIN.map(\n  ([parentJoinName, childJoinName]): NumberTuple =>\n
([PART_IDS[parentJoinName], PART_IDS[childJoinName]]);\n\nconst parentToChildEdges: number[] =\n
parentChildrenTuples.map(([, childJointId]) => childJointId);\n\nconst childToParentEdges: number[] =\n
parentChildrenTuples.map(([\n          parentJointId,\n          ] =>
parentJointId);\n\nfunction getDisplacement(\n  edgeId: number, point: Vector2D, displacements:
TensorBuffer3D): Vector2D {\n  const numEdges = displacements.shape[2] / 2;\n  return {\n    y:
displacements.get(point.y, point.x, edgeId),\n    x: displacements.get(point.y, point.x, numEdges + edgeId)\n
};\n}\n\nfunction getStridedIndexNearPoint(\n  point: Vector2D, outputStride: number, height: number,\n  width:
number): Vector2D {\n  return {\n    y: clamp(Math.round(point.y / outputStride), 0, height - 1),\n    x:
clamp(Math.round(point.x / outputStride), 0, width - 1)\n  };\n}\n\n/**\n * We get a new keypoint along the
`edgeId` for the pose instance, assuming\n * that the position of the `idSource` part is already known. For this, we\n
* follow the displacement vector from the source to target part (stored in\n * the `i`-t channel of the displacement
tensor). The displaced keypoint\n * vector is refined using the offset vector by `offsetRefineStep` times.\n
*\nfunction traverseToTargetKeypoint(\n  edgeId: number, sourceKeypoint: Keypoint, targetKeypointId:
number,\n  scoresBuffer: TensorBuffer3D, offsets: TensorBuffer3D, outputStride: number,\n  displacements:
TensorBuffer3D, offsetRefineStep = 2): Keypoint {\n  const [height, width] = scoresBuffer.shape;\n  // Nearest
neighbor interpolation for the source->target displacements.\n  const sourceKeypointIndices =
getStridedIndexNearPoint(\n    sourceKeypoint.position, outputStride, height, width);\n  const displacement =\n
getDisplacement(edgeId, sourceKeypointIndices, displacements);\n  const displacedPoint =
addVectors(sourceKeypoint.position, displacement);\n  let targetKeypoint = displacedPoint;\n  for (let i = 0; i <
offsetRefineStep; i++) {\n    const targetKeypointIndices =\n      getStridedIndexNearPoint(targetKeypoint,
outputStride, height, width);\n    const offsetPoint = getOffsetPoint(\n      targetKeypointIndices.y,\n
targetKeypointIndices.x, targetKeypointId,\n      offsets);\n    targetKeypoint = addVectors(\n      {\n        x:
targetKeypointIndices.x * outputStride,\n        y: targetKeypointIndices.y * outputStride\n      },\n      {\n
x: offsetPoint.x, y: offsetPoint.y});\n  }\n  const targetKeypointIndices =\n
getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);\n  const score = scoresBuffer.get(\n
targetKeypointIndices.y, targetKeypointIndices.x, targetKeypointId);\n  return {position: targetKeypoint, part:
PART_NAMES[targetKeypointId], score};\n}\n\n/**\n * Follows the displacement fields to decode the full pose of
the object\n * instance given the position of a part that acts as root.\n *\n * @return An array of decoded keypoints
and their scores for a single pose\n */\nexport function decodePose(\n  root: PartWithScore, scores:
TensorBuffer3D, offsets: TensorBuffer3D,\n  outputStride: number, displacementsFwd: TensorBuffer3D,\n
displacementsBwd: TensorBuffer3D): Keypoint[] {\n  const numParts = scores.shape[2];\n  const numEdges =
parentToChildEdges.length;\n  const instanceKeypoints: Keypoint[] = new Array(numParts);\n  // Start a new

```



```

detection instance at the position of the root.\n const {part: rootPart, score: rootScore} = root;\n const rootPoint =
getImageCoords(rootPart, outputStride, offsets);\n\n instanceKeypoints[rootPart.id] = {\n score: rootScore,\n
part: PART_NAMES[rootPart.id],\n position: rootPoint\n };\n\n // Decode the part positions upwards in the tree,
following the backward\n // displacements.\n for (let edge = numEdges - 1; edge >= 0; --edge) {\n const
sourceKeypointId = parentToChildEdges[edge];\n const targetKeypointId = childToParentEdges[edge];\n if
(instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n
instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge,
instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride, displacementsBwd);\n
}\n }\n\n // Decode the part positions downwards in the tree, following the forward\n // displacements.\n for (let
edge = 0; edge < numEdges; ++edge) {\n const sourceKeypointId = childToParentEdges[edge];\n const
targetKeypointId = parentToChildEdges[edge];\n if (instanceKeypoints[sourceKeypointId] &&\n
!instanceKeypoints[targetKeypointId]) {\n instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n
edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride,
displacementsFwd);\n }\n }\n\n return instanceKeypoints;\n }\n\n"/**\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {Keypoint, Pose, TensorBuffer3D} from '../types';\n\nimport {buildPartWithScoreQueue} from
'/build_part_with_score_queue';\n\nimport {decodePose} from '/decode_pose';\n\nimport {getImageCoords,
squaredDistance} from '/util';\n\nfunction withinNmsRadiusOfCorrespondingPoint(\n poses: Pose[],
squaredNmsRadius: number, {x, y}: {x: number, y: number},\n keypointId: number): boolean {\n return
poses.some(({keypoints}) => {\n const correspondingKeypoint = keypoints[keypointId].position;\n return
squaredDistance(\n y, x, correspondingKeypoint.y, correspondingKeypoint.x) <= \n
squaredNmsRadius;\n });\n }\n\n/* Score the newly proposed object instance without taking into account\n *
the scores of the parts that overlap with any previously detected\n * instance.\n */\nfunction getInstanceScore(\n
existingPoses: Pose[], squaredNmsRadius: number,\n instanceKeypoints: Keypoint[]): number {\n let
notOverlappedKeypointScores = instanceKeypoints.reduce(\n (result, {position, score}, keypointId): number =>
{\n if (!withinNmsRadiusOfCorrespondingPoint(\n existingPoses, squaredNmsRadius, position,
keypointId)) {\n result += score;\n }\n return result;\n }, 0.0);\n\n return
notOverlappedKeypointScores / instanceKeypoints.length;\n }\n\n// A point (y, x) is considered as root part
candidate if its score is a\n// maximum in a window |y - y'| <= kLocalMaximumRadius, |x - x'| <= \n//
kLocalMaximumRadius.\nconst kLocalMaximumRadius = 1;\n\n/**\n * Detects multiple poses and finds their parts
from part scores and\n * displacement vectors. It returns up to `maxDetections` object instance\n * detections in
decreasing root score order. It works as follows: We first\n * create a priority queue with local part score maxima
above\n * `scoreThreshold`, considering all parts at the same time. Then we\n * iteratively pull the top element of
the queue (in decreasing score order)\n * and treat it as a root candidate for a new object instance. To avoid\n *
duplicate detections, we reject the root candidate if it is within a disk\n * of `nmsRadius` pixels from the
corresponding part of a previously detected\n * instance, which is a form of part-based non-maximum suppression
(NMS). If\n * the root candidate passes the NMS check, we start a new object instance\n * detection, treating the
corresponding part as root and finding the\n * positions of the remaining parts by following the displacement
vectors\n * along the tree-structured part graph. We assign to the newly detected\n * instance a score equal to the
sum of scores of its parts which have not\n * been claimed by a previous instance (i.e., those at least `nmsRadius`\n
* pixels away from the corresponding part of all previously detected\n * instances), divided by the total number of
parts `numParts`.\n *\n * @param heatmapScores 3-D tensor with shape `[height, width, numParts]`.\n * The value

```

of heatmapScores[y, x, k] is the score of placing the k-th object part at position (y, x). The value of [offsets[y, x, k], offsets[y, x, k + numParts]] is the short range offset vector of the k-th object part at heatmap position (y, x). The displacementsFwd 3-D tensor of shape [height, width, 2 * num_edges], where num_edges = num_parts - 1 is the number of edges (parent-child pairs) in the tree. It contains the forward displacements between consecutive part from the root towards the leaves. The displacementsBwd 3-D tensor of shape [height, width, 2 * num_edges], where num_edges = num_parts - 1 is the number of edges (parent-child pairs) in the tree. It contains the backward displacements between consecutive part from the root towards the leaves.

The output stride that was used when feed-forwarding through the PoseNet model. Must be 32, 16, or 8.

Maximum number of returned instance detections per image.

Only return instance detections that have root part score greater or equal to this value. Defaults to 0.5.

Non-maximum suppression part distance. It needs to be strictly positive. Two parts suppress each other if they are less than nmsRadius pixels away. Defaults to 20.

An array of poses and their scores, each containing keypoints and the corresponding keypoint scores.

```

function decodeMultiplePoses(scoresBuffer: TensorBuffer3D,
offsetsBuffer: TensorBuffer3D,
displacementsFwdBuffer: TensorBuffer3D,
displacementsBwdBuffer:
TensorBuffer3D,
outputStride: number,
maxPoseDetections: number,
scoreThreshold = 0.5,
nmsRadius = 20):
Pose[] {
  const poses: Pose[] = [];
  const queue = buildPartWithScoreQueue(scoreThreshold,
kLocalMaximumRadius, scoresBuffer);
  const squaredNmsRadius = nmsRadius * nmsRadius;
  // Generate at most maxDetections object instances per image in
  // decreasing root part score order.
  while (poses.length < maxPoseDetections && !queue.empty()) {
    // The top element in the queue is the next root candidate.
    const root = queue.dequeue();
    // Part-based non-maximum suppression: We reject a root candidate if it
    // is within a disk of nmsRadius pixels from the corresponding part of
    // a previously detected instance.
    const rootImageCoords =
      getImageCoords(root.part, outputStride, offsetsBuffer);
    if (withinNmsRadiusOfCorrespondingPoint(poses, squaredNmsRadius,
rootImageCoords, root.part.id)) {
      continue;
    }
    // Start a new detection instance at the position of the root.
    const keypoints =
      decodePose(root, scoresBuffer, offsetsBuffer, outputStride,
displacementsFwdBuffer,
displacementsBwdBuffer);
    const score = getInstanceScore(poses, squaredNmsRadius, keypoints);
    poses.push({keypoints, score});
  }
  return poses;
}

```

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```

import * as tf from '@tensorflow/tfjs-core';
import { BaseModel } from './base_model';
const imageNetMean = [-123.15, -115.90, -103.06];
export class ResNet extends BaseModel {
  preprocessInput(input: tf.Tensor3D): tf.Tensor3D {
    return tf.add(input, imageNetMean);
  }
  nameOutputResults(results: tf.Tensor3D[]) {
    const [displacementBwd, displacementFwd, heatmap,
longOffsets, offsets, partHeatmaps, segmentation, partOffsets] = results;
    return [offsets, segmentation, partHeatmaps, longOffsets, heatmap,
displacementFwd, displacementBwd, partOffsets];
  }
}

```

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governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nconst RESNET50_BASE_URL =\n  'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/resnet50';\nconst MOBILENET_BASE_URL =\n  'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/mobilenet';\n\n// The BodyPix 2.0 ResNet50 models use the latest TensorFlow.js 1.0 model\n// format.\nexport function resNet50SavedModel(stride: number, quantBytes: number): string {\n  const graphJson = `model-stride${stride}.json`;\n  // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n  if (quantBytes === 4) {\n    return RESNET50_BASE_URL + `float` + graphJson;\n  } else {\n    return RESNET50_BASE_URL + `quant${quantBytes}` + graphJson;\n  }\n}\n\n// The BodyPix 2.0 MobileNetV1 models use the latest TensorFlow.js 1.0 model\n// format.\nexport function mobileNetSavedModel(stride: number, multiplier: number, quantBytes: number): string {\n  const toStr: {[key: number]: string} = {1.0: '100', 0.75: '075', 0.50: '050'};\n  const graphJson = `model-stride${stride}.json`;\n  // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n  if (quantBytes === 4) {\n    return MOBILENET_BASE_URL + `float/${toStr[multiplier]}` + graphJson;\n  } else {\n    return MOBILENET_BASE_URL + `quant${quantBytes}/${toStr[multiplier]}` +\n      graphJson;\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

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=====\n*\n\nimport * as tf from 'tensorflow/tfjs-core';\nimport {BodyPixInput, BodyPixOutputStride, Padding} from './types';\nimport {Pose, TensorBuffer3D} from './types';\nimport {BodyPixInternalResolution} from './types';\n\nfunction getSizeFromImageLikeElement(input: HTMLImageElement|\n  HTMLCanvasElement|\n    OffscreenCanvas): [number, number] {\n  if ('offsetHeight' in input && input.offsetHeight !== 0 && 'offsetWidth' in input && input.offsetWidth !== 0) {\n    return [input.offsetHeight, input.offsetWidth];\n  } else if (input.height !== null && input.width !== null) {\n    return [input.height, input.width];\n  } else {\n    throw new Error(`HTMLImageElement must have height and width attributes set.`);\n  }\n}\n\nfunction getSizeFromVideoElement(input: HTMLVideoElement): [number, number] {\n  if (input.hasAttribute('height') && input.hasAttribute('width')) {\n    // Prioritizes user specified height and width.\n    // We can't test the .height and .width properties directly,\n    // because they evaluate to 0 if unset.\n    return [input.height, input.width];\n  } else {\n    return [input.videoHeight, input.videoWidth];\n  }\n}\n\nexport function getInputSize(input: BodyPixInput): [number, number] {\n  if ((typeof (HTMLCanvasElement) !== 'undefined' &&\n    input instanceof HTMLCanvasElement) ||\n    (typeof (OffscreenCanvas) !== 'undefined' &&\n    input instanceof OffscreenCanvas) ||\n    (typeof (HTMLImageElement) !== 'undefined' &&\n    input instanceof HTMLImageElement)) {\n    return getSizeFromImageLikeElement(input);\n  } else if (typeof (ImageData) !== 'undefined' && input instanceof ImageData) {\n    return [input.height, input.width];\n  } else if (typeof (HTMLVideoElement) !== 'undefined' && input instanceof HTMLVideoElement) {\n    return getSizeFromVideoElement(input);\n  } else if (input instanceof tf.Tensor) {\n    return [input.shape[0], input.shape[1]];\n  } else {\n    throw new Error(`error: Unknown input type: ${input}`);\n  }\n}\n\nfunction isValidInputResolution(resolution: number, outputStride: number): boolean {\n  return (resolution - 1) % outputStride === 0;\n}\n\nexport function toValidInputResolution(inputResolution: number, outputStride: BodyPixOutputStride): number {\n  if (isValidInputResolution(inputResolution, outputStride)) {\n    return inputResolution;\n  } else {\n    return Math.floor(inputResolution / outputStride) * outputStride + 1;\n  }\n}\n\nconst INTERNAL_RESOLUTION_STRING_OPTIONS = {\n  low: 'low',\n  medium: 'medium',\n  high: 'high',\n  full: 'full'\n};\n\nconst INTERNAL_RESOLUTION_PERCENTAGES = {\n  [INTERNAL_RESOLUTION_STRING_OPTIONS.low]: 0.25,\n
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[INTERNAL_RESOLUTION_STRING_OPTIONS.medium]: 0.5,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.high]: 0.75,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.full]: 1.0\n};\n\nconst MIN_INTERNAL_RESOLUTION =\n0.1;\nconst MAX_INTERNAL_RESOLUTION = 2.0;\n\nfunction toInternalResolutionPercentage(\n  internalResolution: BodyPixInternalResolution): number {\n  if (typeof internalResolution === 'string') {\n    const\n    result = INTERNAL_RESOLUTION_PERCENTAGES[internalResolution];\n    tf.util.assert(\n      typeof result\n      === 'number',\n      () => `string value of inputResolution must be one of ${\n        Object.values(INTERNAL_RESOLUTION_STRING_OPTIONS)\n          .join(',')\n      } but was\n      ${internalResolution}`);\n    return result;\n  } else {\n    tf.util.assert(\n      typeof internalResolution === 'number'\n      &&\n      internalResolution <= MAX_INTERNAL_RESOLUTION &&\n      internalResolution >=\n      MIN_INTERNAL_RESOLUTION,\n      () =>\n        `inputResolution must be a string or number between ${\n          MIN_INTERNAL_RESOLUTION\n          }\n          and ${MAX_INTERNAL_RESOLUTION}, but ` +\n          `was\n          ${internalResolution}`);\n    return internalResolution;\n  }\n}\n\nexport function\n  toInputResolutionHeightAndWidth(\n    internalResolution: BodyPixInternalResolution,\n    outputStride:\n    BodyPixOutputStride,\n    [inputHeight, inputWidth]: [number, number]): [number, number] {\n  const\n  internalResolutionPercentage =\n    toInternalResolutionPercentage(internalResolution);\n  return [\n    toValidInputResolution(\n      inputHeight * internalResolutionPercentage, outputStride),\n    toValidInputResolution(\n      inputWidth * internalResolutionPercentage, outputStride)\n  ];\n}\n\nexport function\n  toInputTensor(input: BodyPixInput) {\n  // TODO: tf.browser.fromPixels types to support OffscreenCanvas\n  //\n  @ts-ignore\n  return input instanceof tf.Tensor ? input : tf.browser.fromPixels(input);\n}\n\nexport function\n  resizeAndPadTo(\n    imageTensor: tf.Tensor3D, [targetH, targetW]: [number, number],\n    flipHorizontal = false):\n  {\n    resizedAndPadded: tf.Tensor3D,\n    paddedBy: [[number, number], [number, number]]\n  } {\n    const [height,\n    width] = imageTensor.shape;\n    const targetAspect = targetW / targetH;\n    const aspect = width / height;\n    let\n    resizeW: number;\n    let resizeH: number;\n    let padL: number;\n    let padR: number;\n    let padT: number;\n    let\n    padB: number;\n    if (aspect > targetAspect) {\n      // resize to have the larger dimension match the shape.\n      resizeW = targetW;\n      resizeH = Math.ceil(resizeW / aspect);\n      const padHeight = targetH - resizeH;\n      padL\n      = 0;\n      padR = 0;\n      padT = Math.floor(padHeight / 2);\n      padB = targetH - (resizeH + padT);\n    } else {\n      resizeH = targetH;\n      resizeW = Math.ceil(targetH * aspect);\n      const padWidth = targetW - resizeW;\n      padL\n      = Math.floor(padWidth / 2);\n      padR = targetW - (resizeW + padL);\n      padT = 0;\n      padB = 0;\n    }\n    const\n    resizedAndPadded = tf.tidy(() => {\n      // resize to have largest dimension match image\n      let resized:\n      tf.Tensor3D;\n      if (flipHorizontal) {\n        resized = tf.image.resizeBilinear(\n          tf.reverse(imageTensor, 1),\n          [resizeH, resizeW]);\n      } else {\n        resized = tf.image.resizeBilinear(imageTensor, [resizeH, resizeW]);\n      }\n      const padded = tf.pad3d(resized, [[padT, padB], [padL, padR], [0, 0]]);\n      return padded;\n    });\n    return\n    {\n      resizedAndPadded, paddedBy: [[padT, padB], [padL, padR]]\n    };\n  }\n\nexport function\n  scaleAndCropToInputTensorShape(\n    tensor: tf.Tensor3D,\n    [inputTensorHeight, inputTensorWidth]: [number,\n    number],\n    [resizedAndPaddedHeight, resizedAndPaddedWidth]: [number, number],\n    [[padT, padB], [padL,\n    padR]]: [[number, number], [number, number]],\n    applySigmoidActivation = false): tf.Tensor3D {\n  return\n  tf.tidy(() => {\n    let inResizedAndPadded: tf.Tensor3D = tf.image.resizeBilinear(tensor,\n    [resizedAndPaddedHeight, resizedAndPaddedWidth], true);\n    if (applySigmoidActivation) {\n      inResizedAndPadded = tf.sigmoid(inResizedAndPadded);\n    }\n    return\n    removePaddingAndResizeBack(\n      inResizedAndPadded, [inputTensorHeight, inputTensorWidth],\n      [[padT, padB], [padL, padR]]);\n  });\n}\n\nexport function\n  removePaddingAndResizeBack(\n    resizedAndPadded: tf.Tensor3D,\n    [originalHeight,\n    originalWidth]: [number, number],\n    [[padT, padB], [padL, padR]]: [[number, number], [number, number]]):\n  tf.Tensor3D {\n  return\n  tf.tidy(() => {\n    const\n    batchedImage: tf.Tensor4D = tf.expandDims(resizedAndPadded);\n    return\n    tf.squeeze(tf.image\n      .cropAndResize(\n        batchedImage, [[\n          padT / (originalHeight +\n          padT + padB - 1.0),\n          padL / (originalWidth + padL + padR - 1.0),\n          (padT + originalHeight - 1.0)\n          ]\n          ^\n          (originalHeight + padT + padB - 1.0),\n          (padL + originalWidth - 1.0) / (originalWidth + padL\n          + padR - 1.0)\n          ],\n          [0, [originalHeight, originalWidth], [0]]);\n  });\n}\n\nexport function\n  resize2d(\n

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    tensor: tf.Tensor2D, resolution: [number, number],\n  nearestNeighbor?: boolean): tf.Tensor2D {\n  return
tf.tidy(() => {\n  const batchSize: number = 1;\n  const batchSize = Math.min(batchSize, tensor.shape[0]);\n  return tf.squeeze(\n
tf.image.resizeBilinear(batchedImage, resolution, nearestNeighbor));\n  });\n}\n\nexport function
padAndResizeTo(\n  input: BodyPixInput, [targetH, targetW]: [number, number]):\n  {resized: tf.Tensor3D,
padding: Padding} {\n  const [height, width] = getInputSize(input);\n  const targetAspect = targetW / targetH;\n
const aspect = width / height;\n  let [padT, padB, padL, padR] = [0, 0, 0, 0];\n  if (aspect < targetAspect) {\n  //
pads the width\n  padT = 0;\n  padB = 0;\n  padL = Math.round(0.5 * (targetAspect * height - width));\n  padR
= Math.round(0.5 * (targetAspect * height - width));\n  } else {\n  // pads the height\n  padT = Math.round(0.5 *
((1.0 / targetAspect) * width - height));\n  padB = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n
padL = 0;\n  padR = 0;\n  }\n\n  const resized: tf.Tensor3D = tf.tidy(() => {\n  let imageTensor =
toInputTensor(input);\n  imageTensor = tf.pad3d(imageTensor, [[padT, padB], [padL, padR], [0, 0]]);\n\n  return
tf.image.resizeBilinear(imageTensor, [targetH, targetW]);\n  });\n\n  return {resized, padding: {top: padT, left: padL,
right: padR, bottom: padB}};\n  }\n\nexport async function toTensorBuffers3D(tensors: tf.Tensor3D[]):\n  Promise<TensorBuffer3D[]> {\n  return Promise.all(tensors.map(tensor => tensor.buffer()));\n  }\n\nexport function
scalePose(\n  pose: Pose, scaleY: number, scaleX: number, offsetY = 0, offsetX = 0): Pose {\n  return {\n
score: pose.score,\n  keypoints: pose.keypoints.map(({score, part, position}) => ({\n
score,\n
part,\n
position: {\n
x: position.x * scaleX +
offsetX,\n
y: position.y * scaleY + offsetY\n
}))\n  });\n  }\n\nexport function scalePoses(\n  poses: Pose[], scaleY: number, scaleX: number, offsetY = 0, offsetX
= 0) {\n  if (scaleX === 1 && scaleY === 1 && offsetY === 0 && offsetX === 0) {\n  return poses;\n  }\n  return
poses.map(pose => scalePose(pose, scaleY, scaleX, offsetY, offsetX));\n  }\n\nexport function
flipPoseHorizontal(pose: Pose, imageWidth: number): Pose {\n  return {\n  score: pose.score,\n  keypoints:
pose.keypoints.map(\n    ({score, part, position}) => ({\n  score,\n  part,\n  position: {x:
imageWidth - 1 - position.x, y: position.y}\n    })\n  });\n  }\n\nexport function flipPosesHorizontal(poses: Pose[],
imageWidth: number) {\n  if (imageWidth <= 0) {\n  return poses;\n  }\n  return poses.map(pose =>
flipPoseHorizontal(pose, imageWidth));\n  }\n\nexport function scaleAndFlipPoses(\n  poses: Pose[], [height,
width]: [number, number],\n  [inputResolutionHeight, inputResolutionWidth]: [number, number],\n  padding:
Padding, flipHorizontal: boolean): Pose[] {\n  const scaleY =\n    (height + padding.top + padding.bottom) /
(inputResolutionHeight);\n  const scaleX =\n    (width + padding.left + padding.right) /
(inputResolutionWidth);\n\n  const scaledPoses =\n    scalePoses(poses, scaleY, scaleX, -padding.top, -
padding.left);\n\n  if (flipHorizontal) {\n  return flipPosesHorizontal(scaledPoses, width);\n  } else {\n  return
scaledPoses;\n  }\n  }\n\n", "\n**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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*\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport
{BaseModel} from './base_model';\nimport {decodeOnlyPartSegmentation, decodePartSegmentation,
toMaskTensor} from './decode_part_map';\nimport {MobileNet} from './mobilenet';\nimport
{decodePersonInstanceMasks, decodePersonInstancePartMasks} from
'/multi_person/decode_instance_masks';\nimport {decodeMultiplePoses} from
'/multi_person/decode_multiple_poses';\nimport {ResNet} from './resnet';\nimport {mobileNetSavedModel,
resNet50SavedModel} from './saved_models';\nimport {BodyPixArchitecture, BodyPixInput,
BodyPixInternalResolution, BodyPixMultiplier, BodyPixOutputStride, BodyPixQuantBytes, Padding} from
'/types';\nimport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation,

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SemanticPersonSegmentation} from './types';\nimport {getInputSize, padAndResizeTo,
scaleAndCropToInputTensorShape, scaleAndFlipPoses, toInputResolutionHeightAndWidth, toTensorBuffers3D}
from './util';\n\nconst APPLY_SIGMOID_ACTIVATION = true;\nconst FLIP_POSES_AFTER_SCALING =
false;\n\n/**\n * BodyPix model loading is configurable using the following config dictionary.\n *\n * `architecture`: BodyPixArchitecture. It determines which BodyPix architecture\n * to load. The supported
architectures are: MobileNetV1 and ResNet50.\n *\n * `outputStride`: Specifies the output stride of the BodyPix
model.\n * The smaller the value, the larger the output resolution, and more accurate\n * the model at the cost of
speed. Set this to a larger value to increase speed\n * at the cost of accuracy. Stride 32 is supported for ResNet and\n
* stride 8,16,32 are supported for various MobileNetV1 models.\n *\n * `multiplier`: An optional number with
values: 1.01, 1.0, 0.75, or\n * 0.50. The value is used only by MobileNet architecture. It is the float\n * multiplier
for the depth (number of channels) for all convolution ops.\n * The larger the value, the larger the size of the layers, and
more accurate\n * the model at the cost of speed. Set this to a smaller value to increase speed\n * at the cost of
accuracy.\n *\n * `modelUrl`: An optional string that specifies custom url of the model. This\n * is useful for
area/countries that don't have access to the model hosted on\n * GCP.\n *\n * `quantBytes`: An optional number
with values: 1, 2, or 4. This parameter\n * affects weight quantization in the models. The available options are\n * 1
byte, 2 bytes, and 4 bytes. The higher the value, the larger the model size\n * and thus the longer the loading time,
the lower the value, the shorter the\n * loading time but lower the accuracy.\n */\nexport interface ModelConfig {\n
architecture: BodyPixArchitecture;\n outputStride: BodyPixOutputStride;\n multiplier?: BodyPixMultiplier;\n
modelUrl?: string;\n quantBytes?: BodyPixQuantBytes;\n}\n\n// The default configuration for loading
MobileNetV1 based BodyPix.\n// (And for references, the default configuration for loading ResNet\n// based
PoseNet is also included).\n// ```\n// const RESNET_CONFIG = {\n//   architecture: 'ResNet50',\n//
outputStride: 32,\n//   quantBytes: 4,\n// } as ModelConfig;\n// ```\n\nconst MOBILENET_V1_CONFIG = {\n
architecture: 'MobileNetV1',\n outputStride: 16,\n quantBytes: 4,\n multiplier: 0.75,\n} as ModelConfig;\n\nconst
VALID_ARCHITECTURE: BodyPixArchitecture[] = ['MobileNetV1', 'ResNet50'];\nconst VALID_STRIDE: {[id:
string]: BodyPixOutputStride[]} = {\n 'MobileNetV1': [8, 16, 32],\n 'ResNet50': [32, 16]\n};\nconst
VALID_MULTIPLIER: {[id: string]: BodyPixMultiplier[]} = {\n 'MobileNetV1': [0.50, 0.75, 1.0],\n 'ResNet50':
[1.0]\n};\nconst VALID_QUANT_BYTES: BodyPixQuantBytes[] = [1, 2, 4];\n\nfunction
validateModelConfig(config: ModelConfig): ModelConfig {\n  config = config || MOBILENET_V1_CONFIG;\n  if (config.architecture == null) {\n    config.architecture = 'MobileNetV1';\n  }\n  if (VALID_ARCHITECTURE.indexOf(config.architecture) < 0) {\n    throw new Error(\n      `Invalid architecture
${config.architecture}.` +\n      `Should be one of ${VALID_ARCHITECTURE}`);\n  }\n  if (config.outputStride
== null) {\n    config.outputStride = 16;\n  }\n  if (VALID_STRIDE[config.architecture].indexOf(config.outputStride) < 0) {\n    throw new Error(\n      `Invalid
outputStride ${config.outputStride}.` +\n      `Should be one of ${VALID_STRIDE[config.architecture]}` +\n
`for architecture ${config.architecture}.`);\n  }\n  if (config.multiplier == null) {\n    config.multiplier = 1.0;\n  }\n  if (VALID_MULTIPLIER[config.architecture].indexOf(config.multiplier) < 0) {\n    throw new Error(\n
`Invalid multiplier ${config.multiplier}.` +\n      `Should be one of
${VALID_MULTIPLIER[config.architecture]}` +\n      `for architecture ${config.architecture}.`);\n  }\n  if (config.quantBytes == null) {\n    config.quantBytes = 4;\n  }\n  if (VALID_QUANT_BYTES.indexOf(config.quantBytes) < 0) {\n    throw new Error(\n      `Invalid quantBytes
${config.quantBytes}.` +\n      `Should be one of ${VALID_QUANT_BYTES}` +\n      `for architecture
${config.architecture}.`);\n  }\n  return config;\n}\n\n/**\n * BodyPix inference is configurable using the
following config dictionary.\n *\n * `flipHorizontal`: If the left-right keypoint of poses/part segmentation\n * should
be flipped/mirrored horizontally. This should be set to true for\n * videos where the video is by default flipped
horizontally (i.e. a webcam),\n * and you want the person & body part segmentation to be returned in the proper\n *
orientation.\n *\n * `internalResolution`: Defaults to 'medium'. The internal resolution\n * percentage that the input
is resized to before inference. The larger the\n * internalResolution the more accurate the model at the cost of
slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or a\n * percentage value between 0

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and 1. The values 'low', 'medium', 'high', and 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.

`segmentationThreshold`: The minimum that segmentation values must have to be considered part of the person. Affects the generation of the segmentation mask. More specifically, it is the threshold used to binarize the intermediate person segmentation probability. The probability of each pixel belongs to a person is in range [0, 1]. If the probability is greater than the `segmentationThreshold`, it will be set to 1 otherwise 0.

`PersonInferenceConfig` {
`flipHorizontal?`: boolean;
`internalResolution?`: BodyPixInternalResolution;
`segmentationThreshold?`: number;
`maxDetections`: Defaults to 10. Maximum number of person pose detections per image.
`scoreThreshold`: Defaults to 0.4. Only return person pose that have root part score greater or equal to this value.
`nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels. It needs to be strictly positive. Two pose keypoints suppress each other if they are less than `nmsRadius` pixels away.
`PersonInstanceInferenceConfig` extends `InferenceConfig` {
`maxDetections?`: number;
`scoreThreshold?`: number;
`nmsRadius?`: number;
`minKeypointScore?`: number;
`refineSteps?`: number;
`maxDetections`: Defaults to 10. Maximum number of returned instance segmentation and pose detections per image.
`scoreThreshold`: Defaults to 0.4. Only returns and uses person poses for instance segmentation assignment when the pose has root part score greater or equal to this value.
`nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels. It needs to be strictly positive. Two parts suppress each other if they are less than `nmsRadius` pixels away.
`minKeypointScore`: Default to 0.3. Keypoints above the score are used for matching and assigning segmentation mask to each person.
`refineSteps`: Default to 10. The number of refinement steps used when assigning the instance segmentation. It needs to be strictly positive. The larger the higher the accuracy and slower the inference.
`MultiPersonInstanceInferenceConfig` extends `InferenceConfig` {
`maxDetections?`: number;
`scoreThreshold?`: number;
`nmsRadius?`: number;
`minKeypointScore?`: number;
`refineSteps?`: number;
`PERSON_INFERENCE_CONFIG`: `PersonInferenceConfig` = {
`flipHorizontal`: false,
`internalResolution`: 'medium',
`segmentationThreshold`: 0.7,
`maxDetections`: 10,
`scoreThreshold`: 0.4,
`nmsRadius`: 20,
`MULTI_PERSON_INSTANCE_INFERENCE_CONFIG`: `MultiPersonInstanceInferenceConfig` = {
`flipHorizontal`: false,
`internalResolution`: 'medium',
`segmentationThreshold`: 0.7,
`maxDetections`: 10,
`scoreThreshold`: 0.4,
`nmsRadius`: 20,
`minKeypointScore`: 0.3,
`refineSteps`: 10
};
function `validatePersonInferenceConfig`(config: `PersonInferenceConfig`) {
const {`segmentationThreshold`, `maxDetections`, `scoreThreshold`, `nmsRadius`} = config;
if (`segmentationThreshold` < 0.0 || `segmentationThreshold` > 1.0) {
throw new Error(`segmentationThreshold \${`segmentationThreshold`}. Should be in range [0.0, 1.0]`);
}
if (`maxDetections` <= 0) {
throw new Error(`Invalid maxDetections \${`maxDetections`}. Should be > 0`);
}
if (`scoreThreshold` < 0.0 || `scoreThreshold` > 1.0) {
throw new Error(`Invalid scoreThreshold \${`scoreThreshold`}. Should be in range [0.0, 1.0]`);
}
if (`nmsRadius` <= 0) {
throw new Error(`Invalid nmsRadius \${`nmsRadius`}`);
}
}
function `validateMultiPersonInstanceInferenceConfig`(config: `MultiPersonInstanceInferenceConfig`) {
const {`segmentationThreshold`, `maxDetections`, `scoreThreshold`, `nmsRadius`, `minKeypointScore`, `refineSteps`} = config;
if (`segmentationThreshold` < 0.0 || `segmentationThreshold` > 1.0) {
throw new Error(`segmentationThreshold \${`segmentationThreshold`}. Should be in range [0.0, 1.0]`);
}
if (`maxDetections` <= 0) {
throw new Error(`Invalid maxDetections \${`maxDetections`}. Should be > 0`);
}
if (`scoreThreshold` < 0.0 || `scoreThreshold` > 1.0) {
throw new Error(`Invalid scoreThreshold \${`scoreThreshold`}. Should be in range [0.0, 1.0]`);
}
if (`nmsRadius` <= 0) {
throw new Error(`Invalid nmsRadius \${`nmsRadius`}`);
}
if (`minKeypointScore` < 0 || `minKeypointScore` > 1) {
throw new Error(`Invalid minKeypointScore \${`minKeypointScore`}. Should be in range [0.0, 1.0]`);
}
if (`refineSteps` <= 0 || `refineSteps` > 20) {
throw new Error(`Invalid refineSteps \${`refineSteps`}. Should be in range [1, 20]`);
}
}
export class `BodyPix` {
baseModel: `BaseModel`;
constructor(net: `BaseModel`) {
this.baseModel = net;
}
private `predictForPersonSegmentation`(input: `tf.Tensor3D`): {
`segmentLogits`: `tf.Tensor3D`,
`heatmapScores`:

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tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n }
{\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n } = this.baseModel.predict(input);\n return {\n segmentLogits: segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n };\n }\n\n private
predictForPersonSegmentationAndPart(input: tf.Tensor3D): {\n segmentLogits: tf.Tensor3D,\n partHeatmapLogits: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd:
tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n } {\n const {\n segmentation,\n partHeatmaps,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = this.baseModel.predict(input);\n
return {\n segmentLogits: segmentation,\n partHeatmapLogits: partHeatmaps,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n };\n }\n\n private
predictForMultiPersonInstanceSegmentationAndPart(input: tf.Tensor3D):\n {\n segmentLogits:
tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n
displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D\n } {\n
const {\n segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n
displacementBwd,\n partHeatmaps,\n } = this.baseModel.predict(input);\n return {\n segmentLogits:
segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
partHeatmaps\n };\n }\n\n /**\n * Given an image with people, returns a dictionary of all intermediate\n *
tensors including: 1) a binary array with 1 for the pixels that are part of\n * the person, and 0 otherwise, 2)
heatmapScores, 3) offsets, and 4) paddings.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal resolution\n * that
the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the
cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n * a percentage value
between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n
*\n * @param segmentationThreshold The minimum that segmentation values must have\n * to be considered
part of the person. Affects the generation of the\n * segmentation mask.\n *\n * @return A dictionary containing
`segmentation`, `heatmapScores`, `offsets`,\n * and `padding`:\n * - `segmentation`: A 2d Tensor with 1 for the
pixels that are part of the\n * person, and 0 otherwise. The width and height correspond to the same\n *
dimensions of the input image.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * pose
estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by pose\n * estimation decoding.\n
* - `displacementFwd`: A 3d Tensor of the keypoint forward displacement used\n * by pose estimation decoding.\n
* - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n * by pose estimation
decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n * before it is fed into the
model.\n */\n segmentPersonActivation(\n input: BodyPixInput, internalResolution:
BodyPixInternalResolution,\n segmentationThreshold = 0.5): {\n segmentation: tf.Tensor2D,\n
heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd:
tf.Tensor3D,\n padding: Padding,\n internalResolutionHeightAndWidth: [number, number]\n } {\n const
[height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n internalResolution, this.baseModel.outputStride, [height, width]);\n
const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n const {\n
segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n heatmapScores,\n offsets,\n displacementFwd,\n
displacementBwd\n } = this.predictForPersonSegmentation(resized);\n\n const [resizedHeight, resizedWidth]
= resized.shape;\n\n const scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits,
[height, width], [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left,
padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n\n return {\n segmentation: toMaskTensor(\n
tf.squeeze(scaledSegmentScores), segmentationThreshold),\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n };\n });\n resized.dispose();\n return {\n segmentation,\n

```



```

heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n
internalResolutionHeightAndWidth\n };\n }\n\n /**\n * Given an image with many people, returns a
PersonSegmentation dictionary\n * that contains the segmentation mask for all people and a single pose.\n *\n *
Note: The segmentation mask returned by this method covers all people but\n * the pose works well for one
person. If you want to estimate instance-level\n * multiple person segmentation & pose for each person, use\n *
`segmentMultiPerson` instead.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param config PersonInferenceConfig object that contains\n * parameters for the
BodyPix inference using person decoding.\n *\n * @return A SemanticPersonSegmentation dictionary that
contains height,\n * width, the flattened binary segmentation mask and the poses for all people.\n * The width and
height correspond to the same dimensions of the input image.\n * - `height`: The height of the segmentation data in
pixel unit.\n * - `width`: The width of the segmentation data in pixel unit.\n * - `data`: The flattened Uint8Array
of segmentation data. 1 means the pixel\n * belongs to a person and 0 means the pixel doesn't belong to a person.
The\n * size of the array is equal to `height` x `width` in row-major order.\n * - `allPoses`: The 2d poses of all
people.\n *\n\n async segmentPerson(\n input: BodyPixInput,\n config: PersonInferenceConfig =
PERSON_INFERENCE_CONFIG):\n Promise<SemanticPersonSegmentation> {\n config =
{...PERSON_INFERENCE_CONFIG, ...config};\n\n validatePersonInferenceConfig(config);\n\n const {\n
segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n
internalResolutionHeightAndWidth\n } =\n this.segmentPersonActivation(\n input,
config.internalResolution, config.segmentationThreshold);\n\n const [height, width] = segmentation.shape;\n\n
const result = await segmentation.data() as Uint8Array;\n segmentation.dispose();\n\n const tensorBuffers =
await toTensorBuffers3D(\n [heatmapScores, offsets, displacementFwd, displacementBwd]);\n const
[scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n\n let poses =
decodeMultiplePoses(\n scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n
this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n\n poses =
scaleAndFlipPoses(\n poses, [height, width], internalResolutionHeightAndWidth, padding,\n
FLIP_POSES_AFTER_SCALING);\n\n heatmapScores.dispose();\n offsets.dispose();\n\n
displacementFwd.dispose();\n displacementBwd.dispose();\n\n return {height, width, data: result, allPoses:
poses};\n }\n\n /**\n * Given an image with multiple people, returns an *array* of\n * PersonSegmentation
object. Each element in the array corresponding to one\n * of the people in the input image. In other words, it
predicts\n * instance-level multiple person segmentation & pose for each person.\n *\n * The model does
standard ImageNet pre-processing before inferring through\n * the model. The image pixels should have values [0-
255].\n *\n * @param input\n * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)
The input\n * image to feed through the network.\n *\n * @param config MultiPersonInferenceConfig object
that contains\n * parameters for the BodyPix inference using multi-person decoding.\n *\n * @return An array of
PersonSegmentation object, each containing a width,\n * height, a binary array (1 for the pixels that are part of
the\n * person, and 0 otherwise) and 2D pose. The array size corresponds to the\n * number of pixels in the
image. The width and height correspond to the\n * dimensions of the image the binary array is shaped to, which are
the same\n * dimensions of the input image.\n *\n\n async segmentMultiPerson(\n input: BodyPixInput,\n
config: MultiPersonInstanceInferenceConfig =\n MULTI_PERSON_INSTANCE_INFERENCE_CONFIG):\n
Promise<PersonSegmentation[]> {\n config = {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG,
...config};\n\n validateMultiPersonInstanceInferenceConfig(config);\n\n const [height, width] =
getInputSize(input);\n\n const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n
config.internalResolution, this.baseModel.outputStride,\n [height, width]);\n\n const {resized, padding} =\n
padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n const {\n segmentation,\n longOffsets,\n
heatmapScoresRaw,\n offsetsRaw,\n displacementFwdRaw,\n displacementBwdRaw,\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n longOffsets,\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n } =

```

```

this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n    const scaledSegmentScores =
scaleAndCropToInputTensorShape(\n        segmentLogits, [height, width], internalResolutionHeightAndWidth,\n        [[padding.top, padding.bottom], [padding.left, padding.right]],\n        APPLY_SIGMOID_ACTIVATION);\n    const longOffsetsResized = false;\n    let scaledLongOffsets;\n    if (longOffsetsResized) {\n    scaledLongOffsets = scaleAndCropToInputTensorShape(\n        longOffsets, [height, width],\n        internalResolutionHeightAndWidth,\n        [[padding.top, padding.bottom], [padding.left, padding.right]],\n        APPLY_SIGMOID_ACTIVATION);\n    } else {\n        scaledLongOffsets = longOffsets;\n    }\n\n    const
segmentation = toMaskTensor(\n        tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n\n    return {\n        segmentation,\n        longOffsets: scaledLongOffsets,\n        heatmapScoresRaw: heatmapScores,\n        offsetsRaw: offsets,\n        displacementFwdRaw: displacementFwd,\n        displacementBwdRaw:
displacementBwd,\n    };}\n\n    const tensorBuffers = await toTensorBuffers3D(\n        [heatmapScoresRaw,\n        offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n    const [scoresBuf, offsetsBuf,\n        displacementsFwdBuf, displacementsBwdBuf] =\n        tensorBuffers;\n\n    let poses = decodeMultiplePoses(\n        scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n        this.baseModel.outputStride,\n        config.maxDetections,\n        config.scoreThreshold, config.nmsRadius);\n\n    poses = scaleAndFlipPoses(\n        poses, [height, width], internalResolutionHeightAndWidth, padding,\n        FLIP_POSES_AFTER_SCALING);\n\n    const instanceMasks = await decodePersonInstanceMasks(\n        segmentation, longOffsets, poses, height, width,\n        this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n        config.scoreThreshold,\n        config.refineSteps, config.minKeypointScore,\n        config.maxDetections);\n\n    resized.dispose();\n    segmentation.dispose();\n    longOffsets.dispose();\n    heatmapScoresRaw.dispose();\n    offsetsRaw.dispose();\n    displacementFwdRaw.dispose();\n    displacementBwdRaw.dispose();\n\n    return instanceMasks;\n }\n\n /**\n *
Given an image with many people, returns a dictionary containing: height,\n * width, a tensor with a part id from 0-24 for the pixels that are\n * part of a corresponding body part, and -1 otherwise. This does standard\n * ImageNet pre-processing before inferring through the model. The image\n * should pixels should have values [0-255].\n *\n * @param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement\n * The input image to feed through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal resolution\n * percentage that the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n * a percentage value between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n *\n * @param segmentationThreshold The minimum that segmentation values must have\n * to be considered part of the person. Affects the clipping of the colored\n * part image.\n *\n * @return A dictionary containing `partSegmentation`, `heatmapScores`,\n * `offsets`, and `padding`:\n * - `partSegmentation`: A 2d Tensor with a part id from 0-24 for\n * the pixels that are part of a corresponding body part, and -1 otherwise.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * single-person pose estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by single-person pose\n * estimation decoding.\n * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement\n * used by pose estimation decoding.\n * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n * by pose estimation decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n * before it is fed into the model.\n *\n * @segmentPersonPartsActivation(\n    input: BodyPixInput,\n    internalResolution: BodyPixInternalResolution,\n    segmentationThreshold = 0.5): {\n    partSegmentation: tf.Tensor2D,\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n    padding: Padding,\n    internalResolutionHeightAndWidth: [number, number]\n    }\n\n    const [height, width] = getInputSize(input);\n    const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n        internalResolution, this.baseModel.outputStride, [height, width]);\n\n    const {\n        resized,\n        padding,\n    } = padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n    const {\n        partSegmentation,\n        heatmapScores,\n        offsets,\n        displacementFwd,\n        displacementBwd\n    } =
tf.tidy(() => {\n        const {\n            segmentLogits,\n            partHeatmapLogits,\n            heatmapScores,\n            offsets,\n            displacementFwd,\n            displacementBwd\n        } = this.predictForPersonSegmentationAndPart(resized);\n

```

```

const [resizedHeight, resizedWidth] = resized.shape;\n\n    const scaledSegmentScores =
scaleAndCropToInputTensorShape(\n        segmentLogits, [height, width], [resizedHeight, resizedWidth],\n    [[padding.top, padding.bottom], [padding.left, padding.right]],\n        APPLY_SIGMOID_ACTIVATION);\n\nconst scaledPartHeatmapScore = scaleAndCropToInputTensorShape(\n        partHeatmapLogits, [height, width],\n    [resizedHeight, resizedWidth],\n        [[padding.top, padding.bottom], [padding.left, padding.right]],\n    APPLY_SIGMOID_ACTIVATION);\n    const segmentation =\n    toMaskTensor(tf.squeeze(scaledSegmentScores), segmentationThreshold);\n    return {\n        partSegmentation:\n            decodePartSegmentation(segmentation, scaledPartHeatmapScore),\n        heatmapScores,\n        offsets,\n        displacementFwd,\n        displacementBwd,\n    };\n    }\n    }\n    resized.dispose();\n    return {\n        partSegmentation,\n        heatmapScores,\n        offsets,\n        displacementFwd,\n        displacementBwd,\n        padding,\n        internalResolutionHeightAndWidth\n    };\n    }\n    }\n    /**\n     * Given an image with many people,
returns a PartSegmentation dictionary that\n     * contains the body part segmentation mask for all people and a single
pose.\n     *\n     * Note: The body part segmentation mask returned by this method covers all\n     * people but the pose
works well when there is one person. If you want to\n     * estimate instance-level multiple person body part
segmentation & pose for\n     * each person, use `segmentMultiPersonParts` instead.\n     *\n     * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n     * The input image to feed
through the network.\n     *\n     * @param config PersonInferenceConfig object that contains\n     * parameters for the
BodyPix inference using single person decoding.\n     *\n     * @return A SemanticPartSegmentation dictionary that
contains height, width,\n     * the flattened binary segmentation mask and the pose for the person. The\n     * width and
height correspond to the same dimensions of the input image.\n     * - `height`: The height of the person part
segmentation data in pixel unit.\n     * - `width`: The width of the person part segmentation data in pixel unit.\n     * -
`data`: The flattened Int32Array of person part segmentation data with a\n     * part id from 0-24 for the pixels that are
part of a corresponding body\n     * part, and -1 otherwise. The size of the array is equal to `height` x\n     * `width` in
row-major order.\n     * - `allPoses`: The 2d poses of all people.\n     */\n    async segmentPersonParts(\n        input:
BodyPixInput,\n        config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):
Promise<SemanticPartSegmentation> {\n        config = {...PERSON_INFERENCE_CONFIG, ...config};\n        validatePersonInferenceConfig(config);\n        const {\n            partSegmentation,\n            heatmapScores,\n            offsets,\n            displacementFwd,\n            displacementBwd,\n            padding,\n            internalResolutionHeightAndWidth\n        } =\n        this.segmentPersonPartsActivation(\n            input, config.internalResolution, config.segmentationThreshold);\n        const [height, width] = partSegmentation.shape;\n        const data = await partSegmentation.data() as Int32Array;\n        partSegmentation.dispose();\n\n        const tensorBuffers = await toTensorBuffers3D(\n            [heatmapScores, offsets,\n            displacementFwd, displacementBwd]);\n        const [scoresBuf, offsetsBuf, displacementsFwdBuf,\n            displacementsBwdBuf] =\n            tensorBuffers;\n\n        let poses = decodeMultiplePoses(\n            scoresBuf, offsetsBuf,\n            displacementsFwdBuf, displacementsBwdBuf,\n            this.baseModel.outputStride, config.maxDetections,\n            config.scoreThreshold, config.nmsRadius);\n\n        poses = scaleAndFlipPoses(\n            poses, [height, width],\n            internalResolutionHeightAndWidth, padding,\n            FLIP_POSES_AFTER_SCALING);\n\n        heatmapScores.dispose();\n        offsets.dispose();\n        displacementFwd.dispose();\n        displacementBwd.dispose();\n\n        return {height, width, data, allPoses: poses};\n    }\n    }\n    /**\n     * Given an image with multiple people, returns an
*array* of PartSegmentation\n     * object. Each element in the array corresponding to one\n     * of the people in the
input image. In other words, it predicts\n     * instance-level multiple person body part segmentation & pose for
each\n     * person.\n     *\n     * This does standard ImageNet pre-processing before inferring through\n     * the model.
The image pixels should have values [0-255].\n     *\n     * @param input\n     *
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n     * image to feed
through the network.\n     *\n     * @param config MultiPersonInferenceConfig object that contains\n     * parameters for the
BodyPix inference using multi-person decoding.\n     *\n     * @return An array of PartSegmentation object, each
containing a width,\n     * height, a flattened array (with part id from 0-24 for the pixels that are\n     * part of a
corresponding body part, and -1 otherwise) and 2D pose. The width\n     * and height correspond to the dimensions of
the image. Each flattened part\n     * segmentation array size is equal to `height` x `width`.\n     */\n    async

```

```

segmentMultiPersonParts(\n  input: BodyPixInput,\n  config: MultiPersonInstanceInferenceConfig = \n
MULTI_PERSON_INSTANCE_INFERENCE_CONFIG): Promise<PartSegmentation[]> {\n  config =
{...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n\n
validateMultiPersonInstanceInferenceConfig(config);\n  const [height, width] = getInputSize(input);\n  const
internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n  config.internalResolution,
this.baseModel.outputStride,\n  [height, width]);\n  const {resized, padding} = \n  padAndResizeTo(input,
internalResolutionHeightAndWidth);\n  const {\n  segmentation,\n  longOffsets,\n  heatmapScoresRaw,\n  offsetsRaw,\n  displacementFwdRaw,\n  displacementBwdRaw,\n  partSegmentation,\n  } = tf.tidy(() =>
{\n  const {\n  segmentLogits,\n  longOffsets,\n  heatmapScores,\n  offsets,\n
displacementFwd,\n  displacementBwd,\n  partHeatmaps\n  } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n\n  // decoding with scaling.\n  const
scaledSegmentScores = scaleAndCropToInputTensorShape(\n  segmentLogits, [height, width],
internalResolutionHeightAndWidth,\n  [[padding.top, padding.bottom], [padding.left, padding.right]],\n
APPLY_SIGMOID_ACTIVATION);\n\n  // decoding with scaling.\n  const scaledPartSegmentationScores =
scaleAndCropToInputTensorShape(\n  partHeatmaps, [height, width], internalResolutionHeightAndWidth,\n
[[padding.top, padding.bottom], [padding.left, padding.right]],\n  APPLY_SIGMOID_ACTIVATION);\n\n
const scaledLongOffsets = longOffsets;\n  const segmentation = toMaskTensor(\n
tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n  const partSegmentation = \n
decodeOnlyPartSegmentation(scaledPartSegmentationScores);\n  return {\n  segmentation,\n  longOffsets:
scaledLongOffsets,\n  heatmapScoresRaw: heatmapScores,\n  offsetsRaw: offsets,\n
displacementFwdRaw: displacementFwd,\n  displacementBwdRaw: displacementBwd,\n
partSegmentation\n  };\n  });\n\n  const tensorBuffers = await toTensorBuffers3D(\n  [heatmapScoresRaw,
offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n  const [scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf] = \n  tensorBuffers;\n\n  let poses = decodeMultiplePoses(\n
scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n  this.baseModel.outputStride,
config.maxDetections,\n  config.scoreThreshold, config.nmsRadius);\n\n  poses = scaleAndFlipPoses(\n
poses, [height, width], internalResolutionHeightAndWidth, padding,\n  FLIP_POSES_AFTER_SCALING);\n\n
const instanceMasks = await decodePersonInstancePartMasks(\n  segmentation, longOffsets, partSegmentation,
poses, height, width,\n  this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n
config.scoreThreshold, config.refineSteps, config.minKeypointScore,\n  config.maxDetections);\n\n
resized.dispose();\n  segmentation.dispose();\n  longOffsets.dispose();\n  heatmapScoresRaw.dispose();\n
offsetsRaw.dispose();\n  displacementFwdRaw.dispose();\n  displacementBwdRaw.dispose();\n
partSegmentation.dispose();\n\n  return instanceMasks;\n  }\n\n  public dispose() {\n  this.baseModel.dispose();\n
}\n}\n\n/**\n * Loads the MobileNet BodyPix model.\n */\n\nasync function loadMobileNet(config: ModelConfig):
Promise<BodyPix> {\n  const outputStride = config.outputStride;\n  const quantBytes = config.quantBytes;\n  const
multiplier = config.multiplier;\n  if (tf == null) {\n  throw new Error(\n  `Cannot find TensorFlow.js. If you are
using a <script> tag, please ` +\n  `also include @tensorflow/tfjs on the page before using this\n  model.`);\n
}\n\n  const url = mobileNetSavedModel(outputStride, multiplier, quantBytes);\n  const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n  const mobilenet = new MobileNet(graphModel, outputStride);\n
return new BodyPix(mobilenet);\n}\n\n/**\n * Loads the ResNet BodyPix model.\n */\n\nasync function
loadResNet(config: ModelConfig): Promise<BodyPix> {\n  const outputStride = config.outputStride;\n  const
quantBytes = config.quantBytes;\n  if (tf == null) {\n  throw new Error(\n  `Cannot find TensorFlow.js. If you
are using a <script> tag, please ` +\n  `also include @tensorflow/tfjs on the page before using this\n
model.`);\n  }\n\n  const url = resNet50SavedModel(outputStride, quantBytes);\n  const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n  const resnet = new ResNet(graphModel, outputStride);\n  return
new BodyPix(resnet);\n}\n\n/**\n * Loads the BodyPix model instance from a checkpoint, with the ResNet\n * or
MobileNet architecture. The model to be loaded is configurable using the\n * config dictionary ModelConfig. Please
find more details in the\n * documentation of the ModelConfig.\n */\n\n * @param config ModelConfig dictionary that

```

contains parameters for the BodyPix loading process. Please find more details of each parameters in the documentation of the ModelConfig interface. The predefined `MOBILENET_V1_CONFIG` and `RESNET_CONFIG` can also be used as references for defining your customized config.

```

export async function load(config: ModelConfig = MOBILENET_V1_CONFIG): Promise<BodyPix> {
  config = validateModelConfig(config);
  if (config.architecture === 'ResNet50') {
    return loadResNet(config);
  } else if (config.architecture === 'MobileNetV1') {
    return loadMobileNet(config);
  } else {
    return null;
  }
}

```

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```

=====
// method copied from bGblur in https://codepen.io/zhaojun/pen/zZmRQe
export function cpuBlur(canvas: HTMLCanvasElement|OffscreenCanvas, image: HTMLImageElement|HTMLVideoElement|HTMLCanvasElement|OffscreenCanvas, blur: number) {
  const ctx = canvas.getContext('2d');
  let sum = 0;
  const delta = 5;
  const alphaLeft = 1 / (2 * Math.PI * delta * delta);
  const step = blur < 3 ? 1 : 2;
  for (let y = -blur; y <= blur; y += step) {
    for (let x = -blur; x <= blur; x += step) {
      const weight = alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta));
      sum += weight;
    }
  }
  for (let y = -blur; y <= blur; y += step) {
    for (let x = -blur; x <= blur; x += step) {
      ctx.globalAlpha = alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta)) / sum * blur;
      ctx.drawImage(image, x, y);
    }
  }
  ctx.globalAlpha = 1;
}

```

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```

=====
import {cpuBlur} from './blur';
import {Color, PartSegmentation, PersonSegmentation} from './types';
import {SemanticPartSegmentation, SemanticPersonSegmentation} from './types';
import {getInputSize} from './util';
export type Canvas = HTMLCanvasElement | OffscreenCanvas;
const offScreenCanvases: {[name: string]: Canvas} = {};
type ImageType = HTMLImageElement|HTMLVideoElement|Canvas;
type HasDimensions = {width: number, height: number};
function isSafari() {
  return /^(?!chrome|android).*safari/i.test(navigator.userAgent);
}
function assertSameDimensions({width: widthA, height: heightA}: HasDimensions, {width: widthB, height: heightB}: HasDimensions, nameA: string, nameB: string) {
  if (widthA !== widthB || heightA !== heightB) {
    throw new Error(`error: dimensions must match. ${nameA} has dimensions ${widthA}x${heightA}, ${nameB} has dimensions ${widthB}x${heightB}`);
  }
}
function flipCanvasHorizontal(canvas: Canvas) {
  const ctx = canvas.getContext('2d');
  ctx.scale(-1, 1);
  ctx.translate(-canvas.width, 0);
}
function drawWithCompositing(ctx: CanvasRenderingContext2D|OffscreenCanvasRenderingContext2D, image: Canvas|ImageType, compositeOperation: string) {
  ctx.globalCompositeOperation = compositeOperation;
  ctx.drawImage(image, 0, 0);
}
function createOffScreenCanvas(): Canvas {
  if (typeof document !== 'undefined') {
    return document.createElement('canvas');
  } else if (typeof OffscreenCanvas !== 'undefined') {
    return new OffscreenCanvas(0, 0);
  } else {
    throw new Error('Cannot create a canvas in this context');
  }
}
function ensureOffscreenCanvasCreated(id: string): Canvas {
  if (!offScreenCanvases[id]) {
    offScreenCanvases[id] = createOffScreenCanvas();
  }
  return offScreenCanvases[id];
}
function drawAndBlurImageOnCanvas(image: ImageType, blurAmount: number, canvas: Canvas) {
  const {height,

```

```

width} = image;\n const ctx = canvas.getContext('2d');\n canvas.width = width;\n canvas.height = height;\n
ctx.clearRect(0, 0, width, height);\n ctx.save();\n if (isSafari()) {\n  cpuBlur(canvas, image, blurAmount);\n } else
{\n  // tslint:disable:no-any\n  (ctx as any).filter = `blur(${blurAmount}px)`;\n  ctx.drawImage(image, 0, 0,
width, height);\n }\n ctx.restore();\n}\n\nfunction drawAndBlurImageOnOffScreenCanvas(\n  image: ImageType,
blurAmount: number,\n  offscreenCanvasName: string): Canvas {\n  const canvas =
ensureOffscreenCanvasCreated(offscreenCanvasName);\n  if (blurAmount === 0) {\n
renderImageToCanvas(image, canvas);\n } else {\n  drawAndBlurImageOnCanvas(image, blurAmount, canvas);\n
}\n  return canvas;\n}\n\nfunction renderImageToCanvas(image: ImageType, canvas: Canvas) {\n  const {width,
height} = image;\n  canvas.width = width;\n  canvas.height = height;\n  const ctx = canvas.getContext('2d');\n  ctx.drawImage(image, 0, 0, width, height);\n}\n\n/**\n * Draw an image on a canvas\n */\nfunction
renderImageDataToCanvas(image: ImageData, canvas: Canvas) {\n  canvas.width = image.width;\n  canvas.height
= image.height;\n  const ctx = canvas.getContext('2d');\n  ctx.putImageData(image, 0, 0);\n}\n\nfunction
renderImageDataToOffScreenCanvas(\n  image: ImageData, canvasName: string): Canvas {\n  const canvas =
ensureOffscreenCanvasCreated(canvasName);\n  renderImageDataToCanvas(image, canvas);\n  return
canvas;\n}\n\n/**\n * Given the output from estimating multi-person segmentation, generates an\n * image with
foreground and background color at each pixel determined by the\n * corresponding binary segmentation value at
the pixel from the output. In\n * other words, pixels where there is a person will be colored with foreground\n *
color and where there is not a person will be colored with background color.\n */\n * @param
personOrPartSegmentation The output from\n * `segmentPerson`, `segmentMultiPerson`,\n * `segmentPersonParts`
or `segmentMultiPersonParts`. They can\n * be SemanticPersonSegmentation object, an array of
PersonSegmentation object,\n * SemanticPartSegmentation object, or an array of PartSegmentation object.\n */\n *
@param foreground Default to {r:0, g:0, b:0, a: 0}. The foreground color\n * (r,g,b,a) for visualizing pixels that
belong to people.\n */\n * @param background Default to {r:0, g:0, b:0, a: 255}. The background color\n * (r,g,b,a)
for visualizing pixels that don't belong to people.\n */\n * @param drawContour Default to false. Whether to draw
the contour around each\n * person's segmentation mask or body part mask.\n */\n * @param foregroundIds Default
to [1]. The integer values that represent\n * foreground. For person segmentation, 1 is the foreground. For body
part\n * segmentation, it can be a subset of all body parts ids.\n */\n * @returns An ImageData with the same width
and height of\n * all the PersonSegmentation in multiPersonSegmentation, with opacity and\n * transparency at each
pixel determined by the corresponding binary\n * segmentation value at the pixel from the output.\n */\n\nexport
function toMask(\n  personOrPartSegmentation: SemanticPersonSegmentation|\n
SemanticPartSegmentation|PersonSegmentation[]|PartSegmentation[],\n  foreground: Color = {\n    r: 0,\n    g:
0,\n    b: 0,\n    a: 0\n  },\n  background: Color = {\n    r: 0,\n    g: 0,\n    b: 0,\n    a: 255\n  },\n
drawContour = false, foregroundIds: number[] = [1]): ImageData {\n  if (Array.isArray(personOrPartSegmentation)
&&\n    personOrPartSegmentation.length === 0) {\n    return null;\n  }\n  let multiPersonOrPartSegmentation:\n
Array<SemanticPersonSegmentation|SemanticPartSegmentation|\n
PersonSegmentation|PartSegmentation>;\n  if (!Array.isArray(personOrPartSegmentation)) {\n
multiPersonOrPartSegmentation = [personOrPartSegmentation];\n  } else {\n    multiPersonOrPartSegmentation =
personOrPartSegmentation;\n  }\n  const {width, height} = multiPersonOrPartSegmentation[0];\n  const bytes =
new Uint8ClampedArray(width * height * 4);\n  function drawStroke(\n    bytes: Uint8ClampedArray, row:
number, column: number, width: number,\n    radius: number, color: Color = {r: 0, g: 255, b: 255, a: 255}) {\n
for (let i = -radius; i <= radius; i++) {\n    for (let j = -radius; j <= radius; j++) {\n      if (i !== 0 && j !== 0) {\n
const n = (row + i) * width + (column + j);\n      bytes[4 * n + 0] = color.r;\n      bytes[4 * n + 1] = color.g;\n
bytes[4 * n + 2] = color.b;\n      bytes[4 * n + 3] = color.a;\n    }\n  }\n}\n\nfunction
isSegmentationBoundary(\n  segmentationData: Uint8Array|Int32Array,\n  row: number,\n  column:
number,\n  width: number,\n  foregroundIds: number[] = [1],\n  radius = 1,\n  ): boolean {\n  let
numberBackgroundPixels = 0;\n  for (let i = -radius; i <= radius; i++) {\n    for (let j = -radius; j <= radius; j++)
{\n      if (i !== 0 && j !== 0) {\n        const n = (row + i) * width + (column + j);\n        if
(!foregroundIds.some(id => id === segmentationData[n])) {\n          numberBackgroundPixels += 1;\n        }\n
}

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}\n }\n }\n return numberBackgroundPixels > 0;\n }\n\n for (let i = 0; i < height; i += 1) {\n   for (let j = 0; j < width; j += 1) {\n     const n = i * width + j;\n     bytes[4 * n + 0] = background.r;\n     bytes[4 * n + 1] = background.g;\n     bytes[4 * n + 2] = background.b;\n     bytes[4 * n + 3] = background.a;\n     for (let k = 0; k < multiPersonOrPartSegmentation.length; k++) {\n       if (foregroundIds.some(\n         id => id === multiPersonOrPartSegmentation[k].data[n])) {\n         bytes[4 * n] = foreground.r;\n         bytes[4 * n + 1] = foreground.g;\n         bytes[4 * n + 2] = foreground.b;\n         bytes[4 * n + 3] = foreground.a;\n         const isBoundary = isSegmentationBoundary(\n           multiPersonOrPartSegmentation[k].data, i, j, width,\n           foregroundIds);\n         if (drawContour && i - 1 >= 0 && i + 1 < height && j - 1 >= 0 && j + 1 < width && isBoundary) {\n           drawStroke(bytes, i, j, width, 1);\n         }\n       }\n     }\n   }\n }\n\n return new ImageData(bytes, width, height);\n}\n\nconst RAINBOW_PART_COLORS: Array<[number, number, number]> = [
\n [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255, 94, 99], [255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n [175, 240, 91], [135, 245, 87], [96, 247, 96], [64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195];\n};\n\n/**
 * Given the output from person body part segmentation (or multi-person
 * instance body part segmentation) and an array of colors indexed by part id,
 * generates an image with the corresponding color for each part at each pixel,
 * and white pixels where there is no part.
 * @param partSegmentation The output from segmentPersonParts
 * or segmentMultiPersonParts. The former is a SemanticPartSegmentation
 * object and later is an array of PartSegmentation object.
 * @param partColors A multi-dimensional array of rgb colors indexed by
 * part id. Must have 24 colors, one for every part.
 * @returns An ImageData with the same width and height of all the element in
 * multiPersonPartSegmentation, with the corresponding color for each part at
 * each pixel, and black pixels where there is no part.
 */\nexport function toColoredPartMask(\n  partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n  partColors: Array<[number, number, number]> = RAINBOW_PART_COLORS): ImageData {\n  if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n    return null;\n  }\n\n  let multiPersonPartSegmentation;\n  if (!Array.isArray(partSegmentation)) {\n    multiPersonPartSegmentation = [partSegmentation];\n  } else {\n    multiPersonPartSegmentation = partSegmentation;\n  }\n\n  const {width, height} = multiPersonPartSegmentation[0];\n  const bytes = new Uint8ClampedArray(width * height * 4);\n  for (let i = 0; i < height * width; ++i) {\n    // invert mask. Invert the segmentation mask.\n    const j = i * 4;\n    bytes[j + 0] = 255;\n    bytes[j + 1] = 255;\n    bytes[j + 2] = 255;\n    bytes[j + 3] = 255;\n    for (let k = 0; k < multiPersonPartSegmentation.length; k++) {\n      const partId = multiPersonPartSegmentation[k].data[i];\n      if (partId !== -1) {\n        const color = partColors[partId];\n        if (!color) {\n          throw new Error(`No color could be found for part id ${partId}`);\n        }\n        bytes[j + 0] = color[0];\n        bytes[j + 1] = color[1];\n        bytes[j + 2] = color[2];\n        bytes[j + 3] = 255;\n      }\n    }\n  }\n\n  return new ImageData(bytes, width, height);\n}\n\nconst CANVAS_NAMES = {\n  blurred: 'blurred',\n  blurredMask: 'blurred-mask',\n  mask: 'mask',\n  lowresPartMask: 'lowres-part-mask';\n};\n\n/**
 * Given an image and a maskImage of type ImageData, draws the image with the
 * mask on top of it onto a canvas.
 * @param canvas The canvas to be drawn onto.
 * @param image The original image to apply the mask to.
 * @param maskImage An ImageData containing the mask. Ideally this should be
 * generated by toMask or toColoredPartMask.
 * @param maskOpacity The opacity of the mask when drawing it on top of the
 * image. Defaults to 0.7. Should be a float between 0 and 1.
 * @param maskBlurAmount How many pixels to blur the mask by. Defaults to 0.
 * Should be an integer between 0 and 20.
 * @param flipHorizontal If the result should be flipped horizontally. Defaults
 * to false.
 */\nexport function drawMask(\n  canvas: Canvas, image: ImageType, maskImage: ImageData|null,\n  maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false) {\n  const [height, width] = getInputSize(image);\n  canvas.width = width;\n  canvas.height = height;\n  const ctx = canvas.getContext('2d');\n  ctx.save();\n  if (flipHorizontal) {\n    flipCanvasHorizontal(canvas);\n  }\n  ctx.drawImage(image, 0, 0);\n  ctx.globalAlpha = maskOpacity;\n  if (maskImage) {\n    assertSameDimensions({width, height}, maskImage, 'image', 'mask');\n    const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n    const blurredMask = drawAndBlurImageOnOffScreenCanvas(\n      mask, maskBlurAmount, CANVAS_NAMES.blurredMask);\n  }\n}

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ctx.drawImage(blurredMask, 0, 0, width, height);\n } \n ctx.restore();\n}\n\n/**\n * Given an image and a\n * maskImage of type ImageData, draws the image with the\n * pixelated mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this should be\n * generated by\n * toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param maskBlurAmount How many pixels to\n * blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the\n * result should be flipped horizontally. Defaults\n * to false.\n *\n * @param pixelCellWidth The width of each pixel\n * cell. Default to 10 px.\n */\nexport function drawPixelatedMask(\n  canvas: Canvas, image: ImageType,\n  maskImage: ImageData,\n  maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false,\n  pixelCellWidth = 10.0) {\n  const [height, width] = getInputSize(image);\n  assertSameDimensions({ width, height }, maskImage,\n  'image', 'mask');\n  const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n  const blurredMask = drawAndBlurImageOnOffScreenCanvas(\n    mask, maskBlurAmount,\n    CANVAS_NAMES.blurredMask);\n  canvas.width = blurredMask.width;\n  canvas.height =\n  blurredMask.height;\n  const ctx = canvas.getContext('2d');\n  ctx.save();\n  if (flipHorizontal) {\n    flipCanvasHorizontal(canvas);\n  }\n  const offscreenCanvas =\n  ensureOffscreenCanvasCreated(CANVAS_NAMES.lowresPartMask);\n  const offscreenCanvasCtx =\n  offscreenCanvas.getContext('2d');\n  offscreenCanvas.width = blurredMask.width * (1.0 / pixelCellWidth);\n  offscreenCanvas.height = blurredMask.height * (1.0 / pixelCellWidth);\n  offscreenCanvasCtx.drawImage(\n  blurredMask, 0, 0, blurredMask.width, blurredMask.height, 0, 0,\n  offscreenCanvas.width,\n  offscreenCanvas.height);\n  ctx.imageSmoothingEnabled = false;\n  ctx.drawImage(\n  offscreenCanvas, 0, 0,\n  offscreenCanvas.width, offscreenCanvas.height, 0,\n  0, canvas.width, canvas.height);\n  // Draws vertical grid\n  lines that are `pixelCellWidth` apart from each other.\n  for (let i = 0; i < offscreenCanvas.width; i++) {\n    ctx.beginPath();\n    ctx.strokeStyle = '#ffffff';\n    ctx.moveTo(pixelCellWidth * i, 0);\n    ctx.lineTo(pixelCellWidth\n  * i, canvas.height);\n    ctx.stroke();\n  }\n  // Draws horizontal grid lines that are `pixelCellWidth` apart from\n  each\n  // other.\n  for (let i = 0; i < offscreenCanvas.height; i++) {\n    ctx.beginPath();\n    ctx.strokeStyle =\n  '#ffffff';\n    ctx.moveTo(0, pixelCellWidth * i);\n    ctx.lineTo(canvas.width, pixelCellWidth * i);\n    ctx.stroke();\n  }\n  ctx.globalAlpha = 1.0 - maskOpacity;\n  ctx.drawImage(image, 0, 0, blurredMask.width,\n  blurredMask.height);\n  ctx.restore();\n}\n\nfunction createPersonMask(\n  multiPersonSegmentation:\n  PersonSegmentation[]|SemanticPersonSegmentation,\n  edgeBlurAmount: number): Canvas {\n  const\n  backgroundMaskImage = toMask(\n  multiPersonSegmentation, {r: 0, g: 0, b: 0, a: 255},\n  {r: 0, g: 0, b: 0, a:\n  0});\n  const backgroundMask =\n  renderImageDataToOffScreenCanvas(backgroundMaskImage,\n  CANVAS_NAMES.mask);\n  if (edgeBlurAmount === 0) {\n    return backgroundMask;\n  } else {\n    return\n  drawAndBlurImageOnOffScreenCanvas(\n  backgroundMask, edgeBlurAmount,\n  CANVAS_NAMES.blurredMask);\n  }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image\n * with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred\n * image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param\n * personSegmentation A SemanticPersonSegmentation or an array of\n * PersonSegmentation object.\n *\n * @param\n * backgroundBlurAmount How many pixels in the background blend into each\n * other. Defaults to 3. Should be an\n * integer between 1 and 20.\n *\n * @param edgeBlurAmount How many pixels to blur on the edge between the\n * person\n * and the background by. Defaults to 3. Should be an integer between 0 and 20.\n *\n * @param\n * flipHorizontal If the output should be flipped horizontally. Defaults\n * to false.\n */\nexport function\n  drawBokehEffect(\n  canvas: Canvas, image: ImageType,\n  multiPersonSegmentation:\n  SemanticPersonSegmentation|PersonSegmentation[],\n  backgroundBlurAmount = 3, edgeBlurAmount = 3,\n  flipHorizontal = false) {\n  const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n  image,\n  backgroundBlurAmount, CANVAS_NAMES.blurred);\n  canvas.width = blurredImage.width;\n  canvas.height =\n  blurredImage.height;\n  const ctx = canvas.getContext('2d');\n  if (Array.isArray(multiPersonSegmentation)\n  &&\n  multiPersonSegmentation.length === 0) {\n    ctx.drawImage(blurredImage, 0, 0);\n    return;\n  }\n}

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const personMask = createPersonMask(multiPersonSegmentation, edgeBlurAmount);\n\n ctx.save();\n if
(flipHorizontal) {\n flipCanvasHorizontal(canvas);\n } // draw the original image on the final canvas\n const
[height, width] = getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n // \"destination-in\" - \"The
existing canvas content is kept where both the\n // new shape and existing canvas content overlap. Everything else
is made\n // transparent.\"\n // crop what's not the person using the mask from the original image\n
drawWithCompositing(ctx, personMask, 'destination-in');\n // \"destination-over\" - \"The existing canvas content is
kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n // draw the blurred background on top of the original image where it doesn't\n // overlap.\n
drawWithCompositing(ctx, blurredImage, 'destination-over');\n ctx.restore();\n}\n\nfunction
createBodyPartMask(\n multiPersonPartSegmentation: SemanticPartSegmentation|PartSegmentation[],\n
bodyPartIdsToMask: number[], edgeBlurAmount: number): Canvas {\n const backgroundMaskImage = toMask(\n
multiPersonPartSegmentation, {r: 0, g: 0, b: 0, a: 0},\n {r: 0, g: 0, b: 0, a: 255}, true, bodyPartIdsToMask);\n
const backgroundMask =\n renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n if (edgeBlurAmount === 0) {\n return backgroundMask;\n } else {\n return
drawAndBlurImageOnOffScreenCanvas(\n backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred
image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param
partSegmentation A SemanticPartSegmentation or an array of\n * PartSegmentation object.\n *\n * @param
bodyPartIdsToBlur Default to [0, 1] (left-face and right-face). An\n * array of body part ids to blur. Each must be
one of the 24 body part ids.\n *\n * @param backgroundBlurAmount How many pixels in the background blend into
each\n * other. Defaults to 3. Should be an integer between 1 and 20.\n *\n * @param edgeBlurAmount How many
pixels to blur on the edge between the person\n * and the background by. Defaults to 3. Should be an integer
between 0 and 20.\n *\n * @param flipHorizontal If the output should be flipped horizontally. Defaults\n * to
false.\n */\n\nexport function blurBodyPart(\n canvas: Canvas, image: ImageType,\n partSegmentation:
SemanticPartSegmentation|PartSegmentation[],\n bodyPartIdsToBlur = [0, 1], backgroundBlurAmount = 3,
edgeBlurAmount = 3,\n flipHorizontal = false) {\n const blurredImage =
drawAndBlurImageOnOffScreenCanvas(\n image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n
canvas.width = blurredImage.width;\n canvas.height = blurredImage.height;\n\n const ctx =
canvas.getContext('2d');\n if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n
ctx.drawImage(blurredImage, 0, 0);\n return;\n }\n const bodyPartMask =\n createBodyPartMask(partSegmentation,
bodyPartIdsToBlur, edgeBlurAmount);\n\n ctx.save();\n if (flipHorizontal)
{\n flipCanvasHorizontal(canvas);\n } // draw the original image on the final canvas\n const [height, width] =
getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n // \"destination-in\" - \"The existing canvas
content is kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n // crop what's not the person using the mask from the original image\n drawWithCompositing(ctx,
bodyPartMask, 'destination-in');\n // \"destination-over\" - \"The existing canvas content is kept where both the\n //
new shape and existing canvas content overlap. Everything else is made\n // transparent.\"\n // draw the blurred
background on top of the original image where it doesn't\n // overlap.\n drawWithCompositing(ctx, blurredImage,
'destination-over');\n ctx.restore();\n}\n\n\", \"*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n
*\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *
=====\n\n*/\n\nexport const PART_CHANNELS: string[] = [\n 'left_face',\n 'right_face',\n 'left_upper_arm_front',\n

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'left_upper_arm_back',\n 'right_upper_arm_front',\n 'right_upper_arm_back',\n 'left_lower_arm_front',\n
'left_lower_arm_back',\n 'right_lower_arm_front',\n 'right_lower_arm_back',\n 'left_hand',\n 'right_hand',\n
'torso_front',\n 'torso_back',\n 'left_upper_leg_front',\n 'left_upper_leg_back',\n 'right_upper_leg_front',\n
'right_upper_leg_back',\n 'left_lower_leg_front',\n 'left_lower_leg_back',\n 'right_lower_leg_front',\n
'right_lower_leg_back',\n 'left_feet',\n 'right_feet\n];\n"/** @license See the LICENSE file. *\n\n// This code is
auto-generated, do not modify this file!\nconst version = '2.2.0';\nexport
{version};\n"],"names":["toFlattenedOneHotPartMap","partHeatmapScores","numParts","shape","partMapLocation
s","tf.argmax","partMapFlattened","tf.reshape","tf.oneHot","clipByMask2d","image","mask","tf.mul","toMaskTens
or","segmentScores","threshold","tf.tidy","tf.cast","tf.greater","tf.scalar","decodePartSegmentation","segmentation
Mask","_a","partMapHeight","partMapWidth","flattenedMap","partNumbers","tf.expandDims","tf.range","tf.matM
ul","partMap","partMapShiftedUpForClipping","tf.add","tf.sub","decodeOnlyPartSegmentation","model","outputStr
ide","this","inputShape","inputs","tf.util","assert","BaseModel","input","asFloat","_this","preprocessInput","asBatc
h","results3d","predict","map","y","tf.squeeze","namedResults","nameOutputResults","heatmapScores","tf.sigmoid
","heatmap","offsets","displacementFwd","displacementBwd","segmentation","partHeatmaps","longOffsets","partOf
fssets","dispose","__extends","MobileNet","tf.div","results","PART_NAMES","NUM_KEYPOINTS","length","PA
RT_IDS","reduce","result","jointName","i","CONNECTED_PART_NAMES","POSE_CHAIN","CONNECTED_P
ART_INDICES","jointNameA","jointNameB","getScale","_b","padding","height","width","inputResolutionY","inp
utResolutionX","padT","padB","getOffsetPoint","x","keypoint","get","getImageCoords","part","heatmapX","heatm
apY","clamp","a","min","max","squaredDistance","y1","x1","y2","x2","dy","dx","addVectors","b","computeDistan
ce","embedding","pose","minPartScore","distance","numKpt","p","keypoints","score","Math","position","Infinity","
convertToPositionInOutput","stride","padL","scaleX","scaleY","round","getEmbedding","location","keypointIndex",
"convertToPosition","outputResolutionX","refineSteps","newLocation","nn","t","newPos","nn_1","matchEmbeddin
gToInstance","poses","numKptForMatching","_c","embed","pair","keypointsIndex","push","kMin","kMinDist","k",
"dist","getOutputResolution","decodeMultipleMasksCPU","posesAboveScore","inHeight","inWidth","dataArrays",
"Uint8Array","fill","j","n","decodeMultiplePartMasksCPU","partSegmentaion","Int32Array","decodeMultipleMask
sWebGL","minKptScore","maxNumPeople","origHeight","origWidth","slice","outHeight","outWidth","shapedLong
Offsets","poseVals","Float32Array","poseOffset","kp","offset","_d","posesTensor","tf.tensor","program","variable
Names","outputShape","userCode","tf.backend","compileAndRun","toPersonKSegmentation","tf.equal","toPersonK
PartSegmentation","bodyParts","isWebGLBackend","getBackend","decodePersonInstanceMasks","minPoseScore","
minKeypointScore","filter","personSegmentations","masksTensorInfo","masksTensor","tf.engine","makeTensorFrom
DataId","dataId","dtype","_","Promise","all","data","personSegmentationsData","forEach","segmentationsData",
"longOffsetsData","decodePersonInstancePartMasks","partSegmentation","partSegmentations","partSegmentationsB
yPersonData","partSegmentaionData","half","floor","maxSize","getElementValue","priorityQueue","Array","numb
erOfElements","MaxHeap","swim","exchange","sink","less","getValueAt","scoreIsMaximumInLocalWindow","key
pointId","localMaximumRadius","scores","localMaximum","yStart","yEnd","yCurrent","xStart","xEnd","xCurrent",
"buildPartWithScoreQueue","scoreThreshold","numKeypoints","queue","enqueue","id","parentChildrenTuples","pa
rentJoinName","childJoinName","parentToChildEdges","childToParentEdges","getDisplacement","edgeId","point",
"displacements","numEdges","getStridedIndexNearPoint","traverseToTargetKeypoint","sourceKeypoint","targetKe
ypointId","scoresBuffer","offsetRefineStep","displacement","targetKeypoint","targetKeypointIndices","offsetPoint",
"targetKeypointIndices","decodePose","root","displacementsFwd","displacementsBwd","instanceKeypoints","root
Part","rootScore","rootPoint","edge","sourceKeypointId","withinNmsRadiusOfCorrespondingPoint","squaredNmsR
adius","some","correspondingKeypoint","getInstanceScore","existingPoses","kLocalMaximumRadius","decodeMul
tiplePoses","offsetsBuffer","displacementsFwdBuffer","displacementsBwdBuffer","maxPoseDetections","nmsRadi
us","empty","dequeue","imageNetMean","ResNet","RESNET50_BASE_URL","MOBILENET_BASE_URL","res
Net50SavedModel","quantBytes","graphJson","mobileNetSavedModel","multiplier","toStr","1","0.75","0.5","getSi
zeFromImageLikeElement","offsetHeight","offsetWidth","Error","getSizeFromVideoElement","hasAttribute","vide
oHeight","videoWidth","getInputSize","HTMLCanvasElement","OffscreenCanvas","HTMLImageElement","Image
Data","HTMLVideoElement","tf.Tensor","isValidInputResolution","resolution","toValidInputResolution","inputRe

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solution","INTERNAL_RESOLUTION_STRING_OPTIONS","low","medium","high","full","INTERNAL_RESOLUTION_PERCENTAGES","MIN_INTERNAL_RESOLUTION","MAX_INTERNAL_RESOLUTION","toInternalResolutionPercentage","internalResolution","Object","values","join","toInputResolutionHeightAndWidth","inputHeight","inputWidth","internalResolutionPercentage","toInputTensor","tf.browser","fromPixels","resizeAndPadTo","imageTensor","flipHorizontal","targetH","targetW","resizeW","resizeH","padR","aspect","padHeight","ceil","padWidth","resizedAndPadded","resized","tf.image","resizeBilinear","tf.reverse","tf.pad3d","paddedBy","scaleAndCropToInputTensorShape","tensor","applySigmoidActivation","inputTensorHeight","inputTensorWidth","resizedAndPaddedHeight","resizedAndPaddedWidth","_e","inResizedAndPadded","removePaddingAndResizeBack","originalHeight","originalWidth","batchedImage","cropAndResize","padAndResizeTo","targetAspect","top","left","right","bottom","toTensorBuffers3D","tensors","buffer","scalePose","offsetY","offsetX","scalePoses","flipPoseHorizontal","imageWidth","flipPosesHorizontal","scaleAndFlipPoses","inputResolutionHeight","inputResolutionWidth","scaledPoses","APPLY_SIGMOID_ACTIVATION","FLIP_POSES_AFTER_SCALING","MOBILENET_V1_CONFIG","architecture","VALID_ARCHITECTURE","VALID_STRIDE","MobileNetV1","ResNet50","VALID_MULTIPLIER","VALID_QUANT_BYTES","validateModelConfig","config","indexOf","PERSON_INFERENCE_CONFIG","segmentationThreshold","maxDetections","MULTI_PERSON_INSTANCE_INFERENCE_CONFIG","validatePersonInferenceConfig","validateMultiPersonInstanceInferenceConfig","net","baseModel","BodyPix","segmentLogits","partHeatmapLogits","internalResolutionHeightAndWidth","predictForPersonSegmentation","resizedHeight","resizedWidth","scaledSegmentScores","segmentPersonActivation","tensorBuffers","scoresBuf","offsetsBuf","displacementsFwdBuf","displacementsBwdBuf","allPoses","scaledLongOffsets","predictForMultiPersonInstanceSegmentationAndPart","heatmapScoresRaw","offsetsRaw","displacementFwdRaw","displacementBwdRaw","instanceMasks","predictForPersonSegmentationAndPart","scaledPartHeatmapScore","segmentPersonPartsActivation","scaledPartSegmentationScores","loadMobileNet","tf","url","tfconv.loadGraphModel","modelUrl","graphModel","mobilenet","loadResNet","resnet","load","cpuBlur","canvas","blur","ctx","getContext","sum","alphaLeft","PI","step","exp","globalAlpha","drawImage","offScreenCanvases","isSafari","test","navigator","userAgent","assertSameDimensions","nameA","nameB","widthA","heightA","widthB","heightB","flipCanvasHorizontal","scale","translate","drawWithCompositing","compositeOperation","globalCompositeOperation","createOffScreenCanvas","document","createElement","ensureOffscreenCanvasCreated","drawAndBlurImageOnCanvas","blurAmount","clearRect","save","restore","drawAndBlurImageOnOffScreenCanvas","offscreenCanvasName","renderImageToCanvas","renderImageDataToCanvas","putImageData","renderImageDataToOffScreenCanvas","canvasName","toMask","personOrPartSegmentation","foreground","background","drawContour","foregroundIds","r","g","isArray","multiPersonOrPartSegmentation","bytes","Uint8ClampedArray","drawStroke","row","column","radius","color","isSegmentationBoundary","segmentationData","numberBackgroundPixels","n_1","isBoundary","RAINBOW_PART_COLORS","toColoredPartMask","partColors","multiPersonPartSegmentation","partId","CANVAS_NAMES","blurred","blurredMask","lowresPartMask","drawMask","maskImage","maskOpacity","maskBlurAmount","drawPixelatedMask","pixelCellWidth","offscreenCanvas","offscreenCanvasCtx","imageSmoothingEnabled","beginPath","strokeStyle","moveTo","lineTo","stroke","createPersonMask","multiPersonSegmentation","edgeBlurAmount","backgroundMask","drawBokehEffect","backgroundBlurAmount","blurredImage","personMask","createBodyPartMask","bodyPartIdsToMask","blurBodyPart","bodyPartIdsToBlur","bodyPartMask","PART_CHANNELS","version"],"mappings":";;;;;;;;;;;;;otEAyBA,SAASA,yBAAyBC,GACcC,IAAMC,EAARD,EAakBE,MAAM,GACnCC,EAAmBC,OAAUJ,EAAMB,GAehDK,EAAMBC,QAAWH,IAAoB,IAEXD,OAAOI,OAAUF,EAakBJ,GAGrC,SAASO,aAAaC,EAAoBC,GACxC,OAAOC,IAAOF,EAAOC,GAGbVb,SAAGbE,aACZC,EAA4BC,GAC9B,OAAOC,KACH,WACI,OAAOC,KAAQC,QACLJ,EAAeK,OAAUJ,IAAa,WAKbPd,SAAGbK,uBACZC,EACApB,GACL,IAAAqB,EAA0CrB,EAakBE,MAA3DoB,OAAeC,OAAcB,OACpC,OAAOc,KAAQ,WAcB,IAAMS,EAAezB,yBAAyBC,GACxCyB,EAAcC,WAAcC,MAAS,EAAG1B,EAAU,EAAG,SAAU,GAE/DI,EACFW,KAAQY,OAAUJ,EAACc,GAA6B,SAE3DI,EAAUVB,QAAWD,GAAmBiB,EAAeC,IAEvDO,EAA8BC,IAAOF,EAASX,OAAU,EAAG,UAEjE,OAAOc,IAAOxB,aACHsB,EAA4CV,GACjDF,OAAU,EAAG,YAIvB,SAAGbE,2BAA2BjC,GAEnC,IAAAqB,EAA0CrB,EAakBE,MAA3DoB,OAAeC,OAAcB,OACpC,OAAOc,KAAQ,WAcB,IAAMS,EAAezB,yBAAyBC,GACxCyB,EAAcC,WAAcC,MAAS,EAAG1B,EAAU,EAAG,SAAU,GAE/DI,EACFW,KAAQY,OAAUJ,EAACc,GAA6B,SAEjE,OAAOnB,QAAWD,GAA

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AWP,EA AcIG,cAAe,IAE1DmB,EA AoBL,MAAR0C,EA AQ1C,OA E1BmG,GACJC,eAAgB,eAAgB,cAAe,SAC/C
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No license file was found, but licenses were detected in source scan.

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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *  
=====\n *\nimport * as tf from '@tensorflow/tfjs-core';\n\n/**\n * Takes the sigmoid of the part heatmap output and  
generates a 2d one-hot\n * tensor with ones where the part's score has the maximum value.\n *\n * @param  
partHeatmapScores\n *\nfunction toFlattenedOneHotPartMap(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n  const numParts = partHeatmapScores.shape[2];\n  const partMapLocations = tf.argmax(partHeatmapScores, 2);\n  const partMapFlattened = tf.reshape(partMapLocations, [-1]);\n  return tf.oneHot(partMapFlattened, numParts) as  
tf.Tensor2D;\n}\n\nfunction clipByMask2d(image: tf.Tensor2D, mask: tf.Tensor2D): tf.Tensor2D {\n  return  
tf.mul(image, mask);\n}\n\n/**\n * Takes the sigmoid of the segmentation output, and generates a segmentation\n * mask with a 1 or 0 at each pixel where there is a person or not a person. The\n * segmentation threshold determines  
the threshold of a score for a pixel for it\n * to be considered part of a person.\n *\n * @param segmentScores A 3d-  
tensor of the sigmoid of the segmentation output.\n * @param segmentationThreshold The minimum that  
segmentation values must have\n * to be considered part of the person. Affects the generation of the\n *  
segmentation mask and the clipping of the colored part image.\n *\n * @returns A segmentation mask with a 1 or 0  
at each pixel where there is a\n * person or not a person.\n *\nexport function toMaskTensor(\n  segmentScores:  
tf.Tensor2D, threshold: number): tf.Tensor2D {\n  return tf.tidy(() => (\n    tf.cast(tf.greater(\n  segmentScores, tf.scalar(threshold)), 'int32') as tf.Tensor2D));\n})\n\n/**\n * Takes the sigmoid of the person and  
part map output, and returns a 2d tensor\n * of an image with the corresponding value at each pixel corresponding to  
the\n * part with the highest value. These part ids are clipped by the segmentation\n * mask. Wherever the a pixel is  
clipped by the segmentation mask, its value\n * will set to -1, indicating that there is no part in that pixel.\n *\n * @param segmentScores A 3d-tensor of the sigmoid of the segmentation output.\n * @param partHeatmapScores A  
3d-tensor of the sigmoid of the part heatmap\n * output. The third dimension corresponds to the part.\n *\n * @returns A 2d tensor of an image with the corresponding value at each pixel\n * corresponding to the part with the  
highest value. These part ids are clipped\n * by the segmentation mask. It will have values of -1 for pixels that are\n *  
* outside of the body and do not have a corresponding part.\n *\nexport function decodePartSegmentation(\n  segmentationMask: tf.Tensor2D,\n  partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n  const [partMapHeight,  
partMapWidth, numParts] = partHeatmapScores.shape;\n  return tf.tidy(() => {\n    const flattenedMap =
```

```

toFlattenedOneHotPartMap(partHeatmapScores);\n  const partNumbers = tf.expandDims(tf.range(0, numParts, 1,
'int32'), 1);\n\n  const partMapFlattened =\n    tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D),
'int32');\n\n  const partMap = tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);\n\n  const
partMapShiftedUpForClipping = tf.add(partMap, tf.scalar(1, 'int32'));\n\n  return tf.sub(clipByMask2d(\n
partMapShiftedUpForClipping as tf.Tensor2D, segmentationMask)\n    , tf.scalar(1, 'int32'));\n  });\n\n\nexport
function decodeOnlyPartSegmentation(partHeatmapScores: tf.Tensor3D):\n  tf.Tensor2D {\n  const
[partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;\n  return tf.tidy(() => {\n  const
flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);\n  const partNumbers =
tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);\n\n  const partMapFlattened =\n
tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');\n\n  return tf.reshape(partMapFlattened,
[partMapHeight, partMapWidth]);\n  });\n}\n", "\n/**\n * @license\n * Copyright 2019 Google Inc. All Rights
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except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\nimport
{BodyPixOutputStride} from './types';\n\n/**\n * BodyPix supports using various convolution neural network
models\n * (e.g. ResNet and MobileNetV1) as its underlying base model.\n * The following BaseModel interface
defines a unified interface for\n * creating such BodyPix base models. Currently both MobileNet (in\n *
./mobilenet.ts) and ResNet (in ./resnet.ts) implements the BaseModel\n * interface. New base models that conform
to the BaseModel interface can be\n * added to BodyPix.\n */\n\nexport abstract class BaseModel {\n  constructor(\n
protected readonly model: tfconv.GraphModel,\n    public readonly outputStride: BodyPixOutputStride) {\n
const inputShape =\n    this.model.inputs[0].shape as [number, number, number, number];\n    tf.util.assert(\n
(inputShape[1] === -1) && (inputShape[2] === -1),\n      () => `Input shape [${inputShape[1]},
${inputShape[2]}]\n      ` +\n      `must both be equal to or -1`);\n  }\n\n  abstract preprocessInput(input:
tf.Tensor3D): tf.Tensor3D;\n\n  /**\n   * Predicts intermediate Tensor representations.\n   * \n   * @param
input The input RGB image of the base\n   * model.\n   * A Tensor of shape: [inputResolution,
inputResolution, 3].\n   * \n   * @return A dictionary of base\n   * model's intermediate predictions.\n   *
The returned dictionary should contains the following elements:\n   * -
heatmapScores: A Tensor3D that represents the keypoint heatmap scores.\n   * - offsets: A Tensor3D that
represents the offsets.\n   * - displacementFwd: A Tensor3D that represents the forward displacement.\n   * -
displacementBwd: A Tensor3D that represents the backward displacement.\n   * - segmentation: A Tensor3D that
represents the segmentation of all\n   * people.\n   * - longOffsets: A Tensor3D that represents the long
offsets used\n   * for\n   * instance grouping.\n   * - partHeatmaps: A Tensor3D that represents the body
part segmentation.\n   */\n\n  predict(input: tf.Tensor3D): {\n    heatmapScores: tf.Tensor3D,\n    offsets:
tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n    segmentation:
tf.Tensor3D,\n    partHeatmaps: tf.Tensor3D,\n    longOffsets: tf.Tensor3D,\n    partOffsets:
tf.Tensor3D\n  } {\n    return tf.tidy(() => {\n      const asFloat =
this.preprocessInput(tf.cast(input, 'float32'));\n      const asBatch = tf.expandDims(asFloat, 0);\n      const
results = this.model.predict(asBatch) as tf.Tensor4D[];\n      const results3d: tf.Tensor3D[] =
results.map(y => tf.squeeze(y, [0]));\n      const namedResults = this.nameOutputResults(results3d);\n      return {\n        heatmapScores:
tf.sigmoid(namedResults.heatmap),\n        offsets: namedResults.offsets,\n        displacementFwd:
namedResults.displacementFwd,\n        displacementBwd: namedResults.displacementBwd,\n        segmentation:
namedResults.segmentation,\n        partHeatmaps: namedResults.partHeatmaps,\n        longOffsets:
namedResults.longOffsets,\n        partOffsets: namedResults.partOffsets\n      }; \n    });\n  }\n\n  // Because
MobileNet and ResNet predict() methods output a different order for\n  // these values, we have a method that
needs to be implemented to order them.\n  abstract nameOutputResults(results: tf.Tensor3D[]): {\n    heatmap:

```

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tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n
segmentation: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n partOffsets:
tf.Tensor3D\n };\n\n /**\n * Releases the CPU and GPU memory allocated by the model.\n */\n dispose() {\n
this.model.dispose();\n }\n}\n\n", "/*\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport { BaseModel } from './base_model';\n\nexport class
MobileNet extends BaseModel {\n  preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n    // Normalize the pixels
[0, 255] to be between [-1, 1].\n    return tf.tidy(() => tf.sub(tf.div(input, 127.5), 1.0));\n  }\n\n  nameOutputResults(results: tf.Tensor3D[]) {\n    const [\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets,\n    ] = results;\n    return {\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets\n    };\n  }\n}\n\n", "/*\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nexport type Tuple<T> = [T, T];\nexport type StringTuple = Tuple<string>;\nexport type NumberTuple =
Tuple<number>;\n\nexport const PART_NAMES = [\n  'nose', 'leftEye', 'rightEye', 'leftEar', 'rightEar',
'leftShoulder',\n  'rightShoulder', 'leftElbow', 'rightElbow', 'leftWrist', 'rightWrist',\n  'leftHip', 'rightHip', 'leftKnee',
'rightKnee', 'leftAnkle', 'rightAnkle'\n];\n\nexport const NUM_KEYPOINTS = PART_NAMES.length;\n\nexport
interface NumberDict {\n  [jointName: string]: number;\n}\n\nexport const PART_IDS =\nPART_NAMES.reduce((result: NumberDict, jointName, i): NumberDict => {\n  result[jointName] = i;\n  return result;\n
}, {});\n\nconst CONNECTED_PART_NAMES: StringTuple[] = [\n  ['leftHip', 'leftShoulder'],\n  ['leftElbow', 'leftShoulder'],\n
['leftElbow', 'leftWrist'],\n  ['leftHip', 'leftKnee'],\n  ['leftKnee', 'leftAnkle'],\n  ['rightHip',
'rightShoulder'],\n  ['rightElbow', 'rightShoulder'],\n  ['rightElbow', 'rightWrist'],\n  ['rightHip', 'rightKnee'],\n
['rightKnee', 'rightAnkle'],\n  ['leftShoulder', 'rightShoulder'],\n  ['leftHip', 'rightHip']\n];\n\n*/\n\n * Define the skeleton.
This defines the parent->child relationships of our\n * tree. Arbitrarily this defines the nose as the root of the tree,
however\n * since we will infer the displacement for both parent->child and\n * child->parent, we can define the
tree root as any node.\n\n*/\n\nexport const POSE_CHAIN: StringTuple[] = [\n  ['nose', 'leftEye'],\n  ['leftEye', 'leftEar'],\n
['nose', 'rightEye'],\n  ['rightEye', 'rightEar'],\n  ['nose', 'leftShoulder'],\n  ['leftShoulder', 'leftElbow'],\n
['leftElbow', 'leftWrist'],\n  ['leftShoulder', 'leftHip'],\n  ['leftHip', 'leftKnee'],\n  ['leftKnee', 'leftAnkle'],\n
['nose', 'rightShoulder'],\n  ['rightShoulder', 'rightElbow'],\n  ['rightElbow', 'rightWrist'],\n  ['rightShoulder', 'rightHip'],\n
['rightHip', 'rightKnee'],\n  ['rightKnee', 'rightAnkle']\n];\n\nexport const CONNECTED_PART_INDICES =
CONNECTED_PART_NAMES.map(([, [jointNameA, jointNameB]) => (\n  (PART_IDS[jointNameA],\n  PART_IDS[jointNameB]));\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n\n*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Part, TensorBuffer3D, Vector2D} from './types';\n\nexport function getScale(\n  [height, width]: [number, number],\n  [inputResolutionY, inputResolutionX]: [number, number],\n  padding: Padding): [number, number] {\n  const {top: padT, bottom: padB, left: padL, right: padR} = padding;\n  const scaleY = inputResolutionY / (padT + padB + height);\n  const scaleX = inputResolutionX / (padL + padR + width);\n  return [scaleX, scaleY];\n}\n\nexport function getOffsetPoint(\n  y: number, x: number, keypoint: number, offsets: TensorBuffer3D): Vector2D {\n  return {\n    y: offsets.get(y, x, keypoint),\n    x: offsets.get(y, x, keypoint + NUM_KEYPOINTS)\n  };\n}\n\nexport function getImageCoords(\n  part: Part, outputStride: number, offsets: TensorBuffer3D): Vector2D {\n  const {heatmapY, heatmapX, id: keypoint} = part;\n  const {x, y} = getOffsetPoint(heatmapY, heatmapX, keypoint, offsets);\n  return {\n    x: part.heatmapX * outputStride + x,\n    y: part.heatmapY * outputStride + y\n  };\n}\n\nexport function fillArray<T>(element: T, size: number): T[] {\n  const result: T[] = new Array(size);\n  for (let i = 0; i < size; i++) {\n    result[i] = element;\n  }\n  return result;\n}\n\nexport function clamp(a: number, min: number, max: number): number {\n  if (a < min) {\n    return min;\n  }\n  if (a > max) {\n    return max;\n  }\n  return a;\n}\n\nexport function squaredDistance(\n  y1: number, x1: number, y2: number, x2: number): number {\n  const dy = y2 - y1;\n  const dx = x2 - x1;\n  return dy * dy + dx * dx;\n}\n\nexport function addVectors(a: Vector2D, b: Vector2D): Vector2D {\n  return {x: a.x + b.x, y: a.y + b.y};\n}\n\nexport function clampVector(a: Vector2D, min: number, max: number): Vector2D {\n  return {y: clamp(a.y, min, max), x: clamp(a.x, min, max)};\n}\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n
```

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=====\n\n*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\nimport {getScale} from './util';\n\ninterface Pair {\n  x: number;\n  y: number;\n}\n\nfunction computeDistance(embedding: Pair[], pose: Pose, minPartScore = 0.3) {\n  let distance = 0.0;\n  let numKpt = 0;\n  for (let p = 0; p < embedding.length; p++) {\n    if (pose.keypoints[p].score > minPartScore) {\n      numKpt += 1;\n      distance += (embedding[p].x - pose.keypoints[p].position.x) ** 2 +\n        (embedding[p].y - pose.keypoints[p].position.y) ** 2;\n    }\n  }\n  if (numKpt === 0) {\n    distance = Infinity;\n  } else {\n    distance = distance / numKpt;\n  }\n  return distance;\n}\n\nfunction convertToPositionInOutput(\n  position: Pair, [padT, padL]: [number, number],\n  [scaleX, scaleY]: [number, number], stride: number): Pair {\n  const y = Math.round(((padT + position.y + 1.0) * scaleY - 1.0) / stride);\n  const x = Math.round(((padL + position.x + 1.0) * scaleX - 1.0) / stride);\n  return {x, y};\n}\n\nfunction getEmbedding(\n  location: Pair, keypointIndex: number,\n  convertToPosition: (pair: Pair) => Pair, outputResolutionX: number,\n  longOffsets: Float32Array, refineSteps: number,\n  [height, width]: [number, number]): Pair {\n  const newLocation = convertToPosition(location);\n  const nn = newLocation.y * outputResolutionX + newLocation.x;\n  let dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n  let dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n  let y = location.y + dy;\n  let x = location.x + dx;\n  for (let t = 0; t < refineSteps; t++) {\n    y = Math.min(y, height - 1);\n    x = Math.min(x, width - 1);\n    const newPos = convertToPosition({x, y});\n    const nn = newPos.y * outputResolutionX + newPos.x;\n    dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n    dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n    y = y + dy;\n    x = x + dx;\n  }\n  return {x, y};\n}\n\nfunction matchEmbeddingToInstance(\n  location: Pair, longOffsets: Float32Array, poses: Pose[],\n  numKptForMatching: number, [padT, padL]: [number, number],\n  [scaleX, scaleY]: [number, number], outputResolutionX: number,\n  [height, width]: [number, number], stride: number,\n  refineSteps: number): number {\n  const embed: Pair[] = [];\n\n
```



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const convertToPosition = (pair: Pair) => \n    convertToPositionInOutput(pair, [padT, padL], [scaleX, scaleY],
stride);\n\n for (let keypointsIndex = 0; keypointsIndex < numKptForMatching;\n    keypointsIndex++) {\n
const embedding = getEmbedding(\n    location, keypointsIndex, convertToPosition, outputResolutionX,\n
longOffsets, refineSteps, [height, width]);\n    embed.push(embedding);\n } \n\n let kMin = -1;\n let kMinDist =
Infinity;\n for (let k = 0; k < poses.length; k++) {\n    const dist = computeDistance(embed, poses[k]);\n    if (dist <
kMinDist) {\n        kMin = k;\n        kMinDist = dist;\n    } \n } \n return kMin;\n } \n\nfunction getOutputResolution(\n
[inputResolutionY, inputResolutionX]: [number, number],\n    stride: number): [number, number] {\n    const
outputResolutionX = Math.round((inputResolutionX - 1.0) / stride + 1.0);\n    const outputResolutionY =
Math.round((inputResolutionY - 1.0) / stride + 1.0);\n    return [outputResolutionX, outputResolutionY];\n } \n\nexport
function decodeMultipleMasksCPU(\n    segmentation: Uint8Array, longOffsets: Float32Array,\n
posesAboveScore: Pose[], height: number, width: number, stride: number,\n    [inHeight, inWidth]: [number,
number], padding: Padding,\n    refineSteps: number, numKptForMatching = 5): Uint8Array[] {\n    const dataArrays
=\n    posesAboveScore.map(x => new Uint8Array(height * width).fill(0));\n\n    const {top: padT, left: padL} =
padding;\n\n    const [scaleX, scaleY] =\n    getScale([height, width], [inHeight, inWidth], padding);\n    const
[outputResolutionX, ] =\n    getOutputResolution([inHeight, inWidth], stride);\n    for (let i = 0; i < height; i += 1) {\n
for (let j = 0; j < width; j += 1) {\n        const n = i * width + j;\n        const prob = segmentation[n];\n        if (prob ===
1) {\n            const kMin = matchEmbeddingToInstance(\n                {x: j, y: i}, longOffsets, posesAboveScore,
numKptForMatching,\n                [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n                stride,
refineSteps);\n            if (kMin >= 0) {\n                dataArrays[kMin][n] = 1;\n            } \n } \n } \n } \n return
dataArrays;\n } \n\nexport function decodeMultiplePartMasksCPU(\n    segmentation: Uint8Array, longOffsets:
Float32Array,\n    partSegmentaion: Uint8Array, posesAboveScore: Pose[], height: number,\n    width: number,
stride: number, [inHeight, inWidth]: [number, number],\n    padding: Padding, refineSteps: number,\n
numKptForMatching = 5): Int32Array[] {\n    const dataArrays =\n    posesAboveScore.map(x => new
Int32Array(height * width).fill(-1));\n\n    const {top: padT, left: padL} = padding;\n\n    const [scaleX, scaleY] =\n    getScale([height, width], [inHeight, inWidth], padding);\n    const [outputResolutionX, ] =\n    getOutputResolution([inHeight, inWidth], stride);\n\n    for (let i = 0; i < height; i += 1) {\n        for (let j = 0; j < width; j
+= 1) {\n            const n = i * width + j;\n            const prob = segmentation[n];\n            if (prob === 1) {\n                const kMin =
matchEmbeddingToInstance(\n                    {x: j, y: i}, longOffsets, posesAboveScore, numKptForMatching,\n                    [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n                    stride, refineSteps);\n                if (kMin >=
0) {\n                    dataArrays[kMin][n] = partSegmentaion[n];\n                } \n } \n } \n } \n return
dataArrays;\n } \n\n", /**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
===== \n
*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport * as tf_webgl from '@tensorflow/tfjs-backend-
webgl';\n\nimport {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Pose} from '../types';\nimport
{getScale} from './util';\n\nexport function decodeMultipleMasksWebGl(\n    segmentation: tf.Tensor2D,\n
longOffsets: tf.Tensor3D,\n    posesAboveScore: Pose[], height: number, width: number, stride: number,\n
[inHeight, inWidth]: [number, number], padding: Padding,\n    refineSteps: number, minKptScore: number,\n
maxNumPeople: number): tf.TensorInfo {\n    // The height/width of the image/canvas itself.\n    const [origHeight,
origWidth] = segmentation.shape;\n    // The height/width of the output of the model.\n    const [outHeight, outWidth]
= longOffsets.shape.slice(0, 2);\n\n    const shapedLongOffsets: tf.Tensor4D =\n    tf.reshape(longOffsets,
[outHeight, outWidth, 2, NUM_KEYPOINTS]);\n\n    // Make pose tensor of shape [MAX_NUM_PEOPLE,
NUM_KEYPOINTS, 3] where\n    // the last 3 coordinates correspond to the score, h and w coordinate of that\n    //

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keypoint.\n const poseVals = new Float32Array(maxNumPeople * NUM_KEYPOINTS * 3).fill(0.0);\n for (let i =
0; i < posesAboveScore.length; i++) {\n  const poseOffset = i * NUM_KEYPOINTS * 3;\n  const pose =
posesAboveScore[i];\n  for (let kp = 0; kp < NUM_KEYPOINTS; kp++) {\n    const keypoint =
pose.keypoints[kp];\n    const offset = poseOffset + kp * 3;\n    poseVals[offset] = keypoint.score;\n
poseVals[offset + 1] = keypoint.position.y;\n    poseVals[offset + 2] = keypoint.position.x;\n  }\n}\n\n const
[scaleX, scaleY] =\n  getScale([height, width], [inHeight, inWidth], padding);\n\n const posesTensor =
tf.tensor(poseVals, [maxNumPeople, NUM_KEYPOINTS, 3]);\n\n const {top: padT, left: padL} = padding;\n\n
const program: tf_webgl.GPGPUProgram = {\n  variableNames: ['segmentation', 'longOffsets', 'poses'],\n
outputShape: [origHeight, origWidth],\n  userCode: `\n  int convertToPositionInOutput(int pos, int pad, float
scale, int stride) {\n    return round((((float(pos + pad) + 1.0) * scale - 1.0) / float(stride));\n  }\n\n  float
convertToPositionInOutputFloat(\n    int pos, int pad, float scale, int stride) {\n    return ((float(pos + pad) + 1.0)
* scale - 1.0) / float(stride);\n  }\n\n  float dist(float x1, float y1, float x2, float y2) {\n    return pow(x1 - x2, 2.0)
+ pow(y1 - y2, 2.0);\n  }\n\n  float sampleLongOffsets(float h, float w, int d, int k) {\n    float fh = fract(h);\n
float fw = fract(w);\n    int c1H = int(ceil(h));\n    int c1W = int(ceil(w));\n    int f1H = int(floor(h));\n    int f1W =
int(floor(w));\n    float o11 = getLongOffsets(f1H, f1W, d, k);\n    float o12 = getLongOffsets(f1H, c1W, d, k);\n
float o21 = getLongOffsets(c1H, f1W, d, k);\n    float o22 = getLongOffsets(c1H, c1W, d, k);\n    float o1 =
mix(o11, o12, fw);\n    float o2 = mix(o21, o22, fw);\n    return mix(o1, o2, fh);\n  }\n\n  int
findNearestPose(int h, int w) {\n    float prob = getSegmentation(h, w);\n    if (prob < 1.0) {\n      return -1;\n
}\n\n    // Done(Tyler): convert from output space h/w to strided space.\n    float stridedH =
convertToPositionInOutputFloat(\n      h, ${padT}, ${scaleY}, ${stride});\n    float stridedW =
convertToPositionInOutputFloat(\n      w, ${padL}, ${scaleX}, ${stride});\n\n    float minDist = 1000000.0;\n
int iMin = -1;\n    for (int i = 0; i < ${maxNumPeople}; i++) {\n      float curDistSum = 0.0;\n      int numKpt
= 0;\n      for (int k = 0; k < ${NUM_KEYPOINTS}; k++) {\n        float dy = sampleLongOffsets(stridedH,
stridedW, 0, k);\n        float dx = sampleLongOffsets(stridedH, stridedW, 1, k);\n\n        float y = float(h) + dy;\n
float x = float(w) + dx;\n\n        for (int s = 0; s < ${refineSteps}; s++) {\n          int yRounded = round(min(y,
float(${height - 1.0}));\n          int xRounded = round(min(x, float(${width - 1.0}));\n          float yStrided =
convertToPositionInOutputFloat(\n            yRounded, ${padT}, ${scaleY}, ${stride});\n          float xStrided =
convertToPositionInOutputFloat(\n            xRounded, ${padL}, ${scaleX}, ${stride});\n          float dy =
sampleLongOffsets(yStrided, xStrided, 0, k);\n          float dx = sampleLongOffsets(yStrided, xStrided, 1, k);\n
          y = y + dy;\n          x = x + dx;\n        }\n\n        float poseScore = getPoses(i, k, 0);\n        float poseY =
getPoses(i, k, 1);\n        float poseX = getPoses(i, k, 2);\n        if (poseScore > ${minKptScore}) {\n
numKpt = numKpt + 1;\n          curDistSum = curDistSum + dist(x, y, poseX, poseY);\n        }\n      }\n      if
(numKpt > 0 && curDistSum / float(numKpt) < minDist) {\n        minDist = curDistSum / float(numKpt);\n
iMin = i;\n      }\n    }\n    return iMin;\n  }\n\n  void main() {\n    ivec2 coords = getOutputCoords();\n
int nearestPose = findNearestPose(coords[0], coords[1]);\n    setOutput(float(nearestPose));\n  }\n\n\n};\n\n
const webglBackend = tf.backend() as tf_webgl.MathBackendWebGL;\n return webglBackend.compileAndRun(\n
  program, [segmentation, shapedLongOffsets, posesTensor]);\n\n"}\n\n", "/*\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport {getBackend} from '@tensorflow/tfjs-core';\nimport
{Padding, PartSegmentation, PersonSegmentation, Pose} from './types';\nimport {decodeMultipleMasksCPU,
decodeMultiplePartMasksCPU} from './decode_multiple_masks_cpu';\nimport {decodeMultipleMasksWebGl} from
'./decode_multiple_masks_webgl';\n\nexport function toPersonKSegmentation(\n  segmentation: tf.Tensor2D, k:

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number): tf.Tensor2D {\n return tf.tidy(\n    () => (tf.cast(tf.equal(\n        segmentation, tf.scalar(k)), 'int32') as
tf.Tensor2D));\n}\n\nexport function toPersonKPartSegmentation(\n    segmentation: tf.Tensor2D, bodyParts:
tf.Tensor2D, k: number): tf.Tensor2D {\n return tf.tidy(\n    () => tf.sub(tf.mul(tf.cast(tf.equal(\n
segmentation, tf.scalar(k)), 'int32'), tf.add(bodyParts, 1)), 1));\n}\n\nfunction isWebGLBackend() {\n return
getBackend() === 'webgl';\n}\n\nexport async function decodePersonInstanceMasks(\n    segmentation:
tf.Tensor2D, longOffsets: tf.Tensor3D, poses: Pose[],\n    height: number, width: number, stride: number,\n    [inHeight, inWidth]: [number, number], padding: Padding, minPoseScore = 0.2,\n    refineSteps = 8, minKeypointScore = 0.3,\n    maxNumPeople = 10): Promise<PersonSegmentation[]> {\n // Filter out poses with
smaller score.\n    const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n\n    let
personSegmentationsData: Uint8Array[];\n\n    if (isWebGLBackend()) {\n        const personSegmentations = tf.tidy(()
=> {\n            const masksTensorInfo = decodeMultipleMasksWebGl(\n                segmentation, longOffsets,
posesAboveScore, height, width, stride,\n                [inHeight, inWidth], padding, refineSteps, minKeypointScore,\n                maxNumPeople);\n            const masksTensor = tf.engine().makeTensorFromDataId(\n                masksTensorInfo.dataId,
masksTensorInfo.shape,\n                masksTensorInfo.dtype) as tf.Tensor2D;\n\n            return posesAboveScore.map(\n
                (_, k) => toPersonKSegmentation(masksTensor, k));\n        });\n\n        personSegmentationsData =\n            (await Promise.all(personSegmentations.map(mask => mask.data())) as\n                Uint8Array[]);\n\n        personSegmentations.forEach(x => x.dispose());\n    } else {\n        const segmentationsData = await
segmentation.data() as Uint8Array;\n        const longOffsetsData = await longOffsets.data() as Float32Array;\n\n        personSegmentationsData = decodeMultipleMasksCPU(\n            segmentationsData, longOffsetsData,
posesAboveScore, height, width,\n            stride, [inHeight, inWidth], padding, refineSteps);\n    }\n\n    return
personSegmentationsData.map(\n        (data, i) => ({data, pose: posesAboveScore[i], width, height});\n    );\n\n    export
async function decodePersonInstancePartMasks(\n        segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D,\n        partSegmentation: tf.Tensor2D, poses: Pose[], height: number, width: number,\n        stride: number, [inHeight, inWidth]: [number, number], padding: Padding,\n        minPoseScore = 0.2, refineSteps = 8, minKeypointScore =
0.3,\n        maxNumPeople = 10): Promise<PartSegmentation[]> {\n        const posesAboveScore = poses.filter(pose =>
pose.score >= minPoseScore);\n\n        let partSegmentationsByPersonData: Int32Array[];\n\n        if (isWebGLBackend())
{\n            const partSegmentations = tf.tidy(() => {\n                const masksTensorInfo = decodeMultipleMasksWebGl(\n
                    segmentation, longOffsets, posesAboveScore, height, width, stride,\n                    [inHeight, inWidth], padding,
refineSteps, minKeypointScore,\n                    maxNumPeople);\n                const masksTensor =
tf.engine().makeTensorFromDataId(\n                    masksTensorInfo.dataId, masksTensorInfo.shape,\n                    masksTensorInfo.dtype) as tf.Tensor2D;\n\n                return posesAboveScore.map(\n
                    (_, k) =>\n                    toPersonKPartSegmentation(masksTensor, partSegmentation, k));\n            });\n\n            partSegmentationsByPersonData =\n                (await Promise.all(partSegmentations.map(x => x.data())) as\n                    Int32Array[]);\n\n            partSegmentations.forEach(x => x.dispose());\n        } else {\n            const segmentationsData = await segmentation.data()
as Uint8Array;\n            const longOffsetsData = await longOffsets.data() as Float32Array;\n            const
partSegmentaionData = await partSegmentation.data() as Uint8Array;\n\n            partSegmentationsByPersonData =
decodeMultiplePartMasksCPU(\n                segmentationsData, longOffsetsData, partSegmentaionData,\n                posesAboveScore, height, width, stride, [inHeight, inWidth], padding,\n                refineSteps);\n        }\n\n        return
partSegmentationsByPersonData.map(\n            (data, k) => ({pose: posesAboveScore[k], data, height,
width});\n        );\n    }\n\n    /*\n    * @license\n    * Copyright 2019 Google Inc. All Rights Reserved.\n    * Licensed under the
Apache License, Version 2.0 (the "License");\n    * you may not use this file except in compliance with the
License.\n    * You may obtain a copy of the License at\n    * http://www.apache.org/licenses/LICENSE-2.0\n    * Unless required by applicable law or agreed to in writing, software\n    * distributed under the License is distributed
on an "AS IS" BASIS,\n    * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n    * See the License for the specific language governing permissions and\n    * limitations under the
License.\n    */\n\n    =====\n\n    *\n\n    // algorithm based on Coursera Lecture from Algorithms, Part 1:\n\n    //

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https://www.coursera.org/learn/algorithms-part1/lecture/ZjoSM/heapsort\n\nfunction half(k: number) {\n return
Math.floor(k / 2);\n}\n\nexport class MaxHeap<T> {\n private priorityQueue: T[];\n private numberOfElements:
number;\n private getElementValue: (element: T) => number;\n\n constructor(maxSize: number, getElementValue:
(element: T) => number) {\n this.priorityQueue = new Array(maxSize);\n this.numberOfElements = -1;\n
this.getElementValue = getElementValue;\n }\n\n public enqueue(x: T): void {\n
this.priorityQueue[++this.numberOfElements] = x;\n this.swim(this.numberOfElements);\n }\n\n public
dequeue(): T {\n const max = this.priorityQueue[0];\n this.exchange(0, this.numberOfElements--);\n
this.sink(0);\n this.priorityQueue[this.numberOfElements + 1] = null;\n return max;\n }\n\n public empty():
boolean {\n return this.numberOfElements === -1;\n }\n\n public size(): number {\n return
this.numberOfElements + 1;\n }\n\n public all(): T[] {\n return this.priorityQueue.slice(0, this.numberOfElements
+ 1);\n }\n\n public max(): T {\n return this.priorityQueue[0];\n }\n\n private swim(k: number): void {\n while
(k > 0 && this.less(half(k), k)) {\n this.exchange(k, half(k));\n k = half(k);\n }\n }\n\n private sink(k:
number): void {\n while (2 * k <= this.numberOfElements) {\n let j = 2 * k;\n if (j < this.numberOfElements
&& this.less(j, j + 1)) {\n j++;\n }\n if (!this.less(k, j)) {\n break;\n }\n this.exchange(k, j);\n
k = j;\n }\n }\n\n private getValueAt(i: number): number {\n return
this.getElementValue(this.priorityQueue[i]);\n }\n\n private less(i: number, j: number): boolean {\n return
this.getValueAt(i) < this.getValueAt(j);\n }\n\n private exchange(i: number, j: number): void {\n const t =
this.priorityQueue[i];\n this.priorityQueue[i] = this.priorityQueue[j];\n this.priorityQueue[j] = t;\n }\n}\n\n", "/**\n
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copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {PartWithScore, TensorBuffer3D} from '../types';\n\nimport {MaxHeap} from
'/max_heap';\n\nfunction scoreIsMaximumInLocalWindow(\n keypointId: number, score: number, heatmapY:
number, heatmapX: number,\n localMaximumRadius: number, scores: TensorBuffer3D): boolean {\n const
[height, width] = scores.shape;\n\n let localMaximum = true;\n const yStart = Math.max(heatmapY -
localMaximumRadius, 0);\n const yEnd = Math.min(heatmapY + localMaximumRadius + 1, height);\n for (let
yCurrent = yStart; yCurrent < yEnd; ++yCurrent) {\n const xStart = Math.max(heatmapX - localMaximumRadius,
0);\n const xEnd = Math.min(heatmapX + localMaximumRadius + 1, width);\n for (let xCurrent = xStart;
xCurrent < xEnd; ++xCurrent) {\n if (scores.get(yCurrent, xCurrent, keypointId) > score) {\n localMaximum
= false;\n break;\n }\n }\n if (!localMaximum) {\n break;\n }\n }\n\n return
localMaximum;\n}\n\n/**\n * Builds a priority queue with part candidate positions for a specific image in\n * the
batch. For this we find all local maxima in the score maps with score\n * values above a threshold. We create a
single priority queue across all parts.\n *\nexport function buildPartWithScoreQueue(\n scoreThreshold: number,
localMaximumRadius: number,\n scores: TensorBuffer3D): MaxHeap<PartWithScore> {\n const [height, width,
numKeypoints] = scores.shape;\n\n const queue = new MaxHeap<PartWithScore>(\n height * width *
numKeypoints, ({score}) => score);\n\n for (let heatmapY = 0; heatmapY < height; ++heatmapY) {\n for (let
heatmapX = 0; heatmapX < width; ++heatmapX) {\n for (let keypointId = 0; keypointId < numKeypoints;
++keypointId) {\n const score = scores.get(heatmapY, heatmapX, keypointId);\n // Only consider parts
with score greater or equal to threshold as\n // root candidates.\n if (score < scoreThreshold) {\n
continue;\n }\n // Only consider keypoints whose score is maximum in a local window.\n if
(scoreIsMaximumInLocalWindow(\n keypointId, score, heatmapY, heatmapX, localMaximumRadius,\n
scores)) {\n queue.enqueue({score, part: {heatmapY, heatmapX, id: keypointId}});\n }\n }\n }\n }\n\n return queue;\n}\n\n", "/**\n
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {NumberTuple, PART_IDS, PART_NAMES, POSE_CHAIN} from './keypoints';\nimport {Keypoint,  
PartWithScore, TensorBuffer3D, Vector2D} from './types';\nimport {clamp, getOffsetPoint} from './util';\nimport  
{addVectors, getImageCoords} from './util';\n\nconst parentChildrenTuples: NumberTuple[] =  
POSE_CHAIN.map(\n  ([parentJoinName, childJoinName]): NumberTuple =>\n    ([PART_IDS[parentJoinName], PART_IDS[childJoinName]]);\n\nconst parentToChildEdges: number[] =\n  parentChildrenTuples.map(([, childJointId]) => childJointId);\n\nconst childToParentEdges: number[] =\n  parentChildrenTuples.map(([\n    parentJointId,\n    parentJointId,\n  ]) =>  
    parentJointId);\n\nfunction getDisplacement(\n  edgeId: number, point: Vector2D, displacements:  
TensorBuffer3D): Vector2D {\n  const numEdges = displacements.shape[2] / 2;\n  return {\n    y:  
    displacements.get(point.y, point.x, edgeId),\n    x: displacements.get(point.y, point.x, numEdges + edgeId)\n  };\n}\n\nfunction getStridedIndexNearPoint(\n  point: Vector2D, outputStride: number, height: number,\n  width:  
number): Vector2D {\n  return {\n    y: clamp(Math.round(point.y / outputStride), 0, height - 1),\n    x:  
    clamp(Math.round(point.x / outputStride), 0, width - 1)\n  };\n}\n\n/**\n * We get a new keypoint along the  
`edgeId` for the pose instance, assuming\n * that the position of the `idSource` part is already known. For this, we\n * follow the displacement vector from the source to target part (stored in\n * the `i`-t channel of the displacement  
tensor). The displaced keypoint\n * vector is refined using the offset vector by `offsetRefineStep` times.\n */\nfunction traverseToTargetKeypoint(\n  edgeId: number, sourceKeypoint: Keypoint, targetKeypointId:  
number,\n  scoresBuffer: TensorBuffer3D, offsets: TensorBuffer3D, outputStride: number,\n  displacements:  
TensorBuffer3D, offsetRefineStep = 2): Keypoint {\n  const [height, width] = scoresBuffer.shape;\n  // Nearest  
neighbor interpolation for the source->target displacements.\n  const sourceKeypointIndices =  
  getStridedIndexNearPoint(\n    sourceKeypoint.position, outputStride, height, width);\n  const displacement =\n    getDisplacement(edgeId, sourceKeypointIndices, displacements);\n  const displacedPoint =  
  addVectors(sourceKeypoint.position, displacement);\n  let targetKeypoint = displacedPoint;\n  for (let i = 0; i <  
    offsetRefineStep; i++) {\n    const targetKeypointIndices =\n      getStridedIndexNearPoint(targetKeypoint,  
outputStride, height, width);\n    const offsetPoint = getOffsetPoint(\n      targetKeypointIndices.y,  
targetKeypointIndices.x, targetKeypointId,\n      offsets);\n    targetKeypoint = addVectors(\n      {\n        x:  
        targetKeypointIndices.x * outputStride,\n        y: targetKeypointIndices.y * outputStride\n      },\n      {\n        x:  
        offsetPoint.x, y: offsetPoint.y\n      });\n  }\n  const targetKeypointIndices =\n    getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);\n  const score = scoresBuffer.get(\n    targetKeypointIndices.y, targetKeypointIndices.x, targetKeypointId);\n  return {position: targetKeypoint, part:  
PART_NAMES[targetKeypointId], score};\n}\n\n/**\n * Follows the displacement fields to decode the full pose of  
the object\n * instance given the position of a part that acts as root.\n */\n * @return An array of decoded keypoints  
and their scores for a single pose\n */\nexport function decodePose(\n  root: PartWithScore, scores:  
TensorBuffer3D, offsets: TensorBuffer3D,\n  outputStride: number, displacementsFwd: TensorBuffer3D,\n  displacementsBwd: TensorBuffer3D): Keypoint[] {\n  const numParts = scores.shape[2];\n  const numEdges =  
  parentToChildEdges.length;\n  const instanceKeypoints: Keypoint[] = new Array(numParts);\n  // Start a new  
detection instance at the position of the root.\n  const {part: rootPart, score: rootScore} = root;\n  const rootPoint =  
  getImageCoords(rootPart, outputStride, offsets);\n  instanceKeypoints[rootPart.id] = {\n    score: rootScore,\n    part: PART_NAMES[rootPart.id],\n    position: rootPoint\n  };\n  // Decode the part positions upwards in the tree,  
following the backward\n  // displacements.\n  for (let edge = numEdges - 1; edge >= 0; --edge) {\n    const  
sourceKeypointId = parentToChildEdges[edge];\n    const targetKeypointId = childToParentEdges[edge];\n    if  
(instanceKeypoints[sourceKeypointId] &&\n      !instanceKeypoints[targetKeypointId]) {\n
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instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n
edge,
instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n
offsets, outputStride, displacementsBwd);\n
}\n }\n\n // Decode the part positions downwards in the tree, following the forward\n // displacements.\n for (let
edge = 0; edge < numEdges; ++edge) {\n const sourceKeypointId = childToParentEdges[edge];\n const
targetKeypointId = parentToChildEdges[edge];\n if (instanceKeypoints[sourceKeypointId] &&\n
!instanceKeypoints[targetKeypointId]) {\n instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n
edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n
offsets, outputStride,
displacementsFwd);\n }\n }\n\n return instanceKeypoints;\n }\n\n", "/*\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Keypoint, Pose, TensorBuffer3D} from './types';\n\nimport {buildPartWithScoreQueue} from
 './build_part_with_score_queue';\nimport {decodePose} from './decode_pose';\nimport {getImageCoords,
squaredDistance} from './util';\n\nfunction withinNmsRadiusOfCorrespondingPoint(\n poses: Pose[],
squaredNmsRadius: number, {x, y}: {x: number, y: number},\n keypointId: number): boolean {\n return
poses.some(({keypoints}) => {\n const correspondingKeypoint = keypoints[keypointId].position;\n return
squaredDistance(\n y, x, correspondingKeypoint.y, correspondingKeypoint.x) <= \n
squaredNmsRadius;\n });\n }\n\n/* Score the newly proposed object instance without taking into account\n *
the scores of the parts that overlap with any previously detected\n * instance.\n */\nfunction getInstanceScore(\n
existingPoses: Pose[], squaredNmsRadius: number,\n instanceKeypoints: Keypoint[]): number {\n let
notOverlappedKeypointScores = instanceKeypoints.reduce(\n (result, {position, score}, keypointId): number =>
{\n if (!withinNmsRadiusOfCorrespondingPoint(\n existingPoses, squaredNmsRadius, position,
keypointId)) {\n result += score;\n }\n return result;\n }, 0.0);\n\n return
notOverlappedKeypointScores / instanceKeypoints.length;\n }\n\n// A point (y, x) is considered as root part
candidate if its score is a\n// maximum in a window |y - y'| <= kLocalMaximumRadius, |x - x'| <= \n//
kLocalMaximumRadius.\n\nconst kLocalMaximumRadius = 1;\n\n/**\n * Detects multiple poses and finds their parts
from part scores and\n * displacement vectors. It returns up to `maxDetections` object instance\n *
detections in decreasing root score order. It works as follows: We first\n * create a priority queue with local
part score maxima above\n * `scoreThreshold`, considering all parts at the same time. Then we\n * iteratively
pull the top element of the queue (in decreasing score order)\n * and treat it as a root candidate for a new
object instance. To avoid\n * duplicate detections, we reject the root candidate if it is within a disk\n *
of `nmsRadius` pixels from the corresponding part of a previously detected\n * instance, which is a form of
part-based non-maximum suppression (NMS). If\n * the root candidate passes the NMS check, we start a new
object instance\n * detection, treating the corresponding part as root and finding the\n * positions of the
remaining parts by following the displacement vectors\n * along the tree-structured part graph. We assign to
the newly detected\n * instance a score equal to the sum of scores of its parts which have not\n * been
claimed by a previous instance (i.e., those at least `nmsRadius`\n * pixels away from the corresponding
part of all previously detected\n * instances), divided by the total number of parts `numParts`.\n *
@param heatmapScores 3-D tensor with shape `[height, width, numParts]`.\n * The value of
heatmapScores[y, x, k] is the score of placing the `k`-th\n * object part at position `(y, x)`.\n *
@param offsets 3-D tensor with shape `[height, width, numParts * 2]`.\n * The value of [offsets[y, x, k],
offsets[y, x, k + numParts]] is the\n * short range offset vector of the `k`-th object part at heatmap\n *
position `(y, x)`.\n *
@param displacementsFwd 3-D tensor of shape\n * `[height, width, 2 * num_edges]`, where `num_edges =
num_parts - 1` is the\n * number of edges (parent-child pairs) in the tree. It contains the forward\n *
displacements between consecutive part from the root towards the leaves.\n *
@param displacementsBwd 3-D tensor of

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shape` [height, width, 2 * num_edges]`, where `num_edges = num_parts - 1` is the
number of edges (parent-child pairs) in the tree. It contains the backward
displacements between consecutive part from the root towards
the leaves.
@param outputStride The output stride that was used when feed-forwarding
through the PoseNet model. Must be 32, 16, or 8.
@param maxPoseDetections Maximum number of returned instance
detections per image.
@param scoreThreshold Only return instance detections that have root part
score greater or equal to this value. Defaults to 0.5.
@param nmsRadius Non-maximum suppression part
distance. It needs to be strictly positive. Two parts suppress each other if they are less than
`nmsRadius`
pixels away. Defaults to 20.
@return An array of poses and their scores, each containing keypoints and
the corresponding keypoint scores.
\nexport function decodeMultiplePoses(\n  scoresBuffer: TensorBuffer3D,\n  offsetsBuffer: TensorBuffer3D,\n  displacementsFwdBuffer: TensorBuffer3D,\n  displacementsBwdBuffer:\n  TensorBuffer3D, outputStride: number,\n  maxPoseDetections: number, scoreThreshold = 0.5, nmsRadius = 20):\n  Pose[] {\n    const poses: Pose[] = [];\n    const queue = buildPartWithScoreQueue(\n      scoreThreshold,\n      kLocalMaximumRadius, scoresBuffer);\n    const squaredNmsRadius = nmsRadius * nmsRadius;\n    // Generate\n    at most maxDetections object instances per image in\n    // decreasing root part score order.\n    while (poses.length <\n    maxPoseDetections && !queue.empty()) {\n      // The top element in the queue is the next root candidate.\n      const\n      root = queue.dequeue();\n      // Part-based non-maximum suppression: We reject a root candidate if it\n      // is\n      within a disk of `nmsRadius` pixels from the corresponding part of\n      // a previously detected instance.\n      const\n      rootImageCoords =\n        getImageCoords(root.part, outputStride, offsetsBuffer);\n      if\n      (withinNmsRadiusOfCorrespondingPoint(\n        poses, squaredNmsRadius, rootImageCoords, root.part.id)) {\n        continue;\n      }\n      // Start a new detection instance at the position of the root.\n      const keypoints =\n        decodePose(\n          root, scoresBuffer, offsetsBuffer, outputStride, displacementsFwdBuffer,\n          displacementsBwdBuffer);\n      const score = getInstanceScore(poses, squaredNmsRadius, keypoints);\n      poses.push({keypoints, score});\n    }\n    return poses;\n  }\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\nimport * as tf from 'tensorflow/tfjs-core';\nimport { BaseModel } from './base_model';\nconst\nimageNetMean = [-123.15, -115.90, -103.06];\nexport class ResNet extends BaseModel {\n  preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n    return tf.add(input, imageNetMean);\n  }\n\n  nameOutputResults(results: tf.Tensor3D[]) {\n    const [\n      displacementBwd,\n      displacementFwd,\n      heatmap,\n      longOffsets,\n      offsets,\n      partHeatmaps,\n      segmentation,\n      partOffsets,\n      ] = results;\n    return [\n      offsets,\n      segmentation,\n      partHeatmaps,\n      longOffsets,\n      heatmap,\n      displacementFwd,\n      displacementBwd,\n      partOffsets\n      ];\n  }\n\n"/**\n * @license\n * Copyright 2019\n * Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\nconst RESNET50_BASE_URL =\n  'https://storage.googleapis.com/tfjs-\n  models/savedmodel/bodypix/resnet50';\nconst MOBILENET_BASE_URL =\n  'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/mobilenet';\n// The BodyPix 2.0 ResNet50\nmodels use the latest TensorFlow.js 1.0 model\n// format.\nexport function resNet50SavedModel(stride: number,

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quantBytes: number): string {\n  const graphJson = `model-stride${stride}.json`;\n  // quantBytes=4 corresponding
to the non-quantized full-precision SavedModel.\n  if (quantBytes === 4) {\n    return RESNET50_BASE_URL +
`float` + graphJson;\n  } else {\n    return RESNET50_BASE_URL + `quant${quantBytes}` + graphJson;\n
}\n}\n\n// The BodyPix 2.0 MobileNetV1 models use the latest TensorFlow.js 1.0 model\n// format.\nexport
function mobileNetSavedModel(\n  stride: number, multiplier: number, quantBytes: number): string {\n  const
toStr: {[key: number]: string} = {1.0: '100', 0.75: '075', 0.50: '050'};\n  const graphJson = `model-
stride${stride}.json`;\n  // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n  if
(quantBytes === 4) {\n    return MOBILENET_BASE_URL + `float/${toStr[multiplier]}` + graphJson;\n  } else
{\n    return MOBILENET_BASE_URL + `quant${quantBytes}/${toStr[multiplier]}` +\n    graphJson;\n
}\n}\n", "/*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport {BodyPixInput, BodyPixOutputStride, Padding} from
'./types';\nimport {Pose, TensorBuffer3D} from './types';\nimport {BodyPixInternalResolution} from
'./types';\n\nfunction getSizeFromImageLikeElement(input: HTMLImageElement|\nHTMLCanvasElement|\nOffscreenCanvas): [number, number] {\n  if ('offsetHeight' in input
&& input.offsetHeight !== 0\n    && 'offsetWidth' in input && input.offsetWidth !== 0) {\n    return
[input.offsetHeight, input.offsetWidth];\n  } else if (input.height != null && input.width != null) {\n    return
[input.height, input.width];\n  } else {\n    throw new Error(\n    `HTMLImageElement must have height and
width attributes set.`);\n  }\n}\n\nfunction getSizeFromVideoElement(input: HTMLVideoElement): [number,
number] {\n  if (input.hasAttribute('height') && input.hasAttribute('width')) {\n    // Prioritizes user specified height
and width.\n    // We can't test the .height and .width properties directly,\n    // because they evaluate to 0 if unset.\n    return [input.height, input.width];\n  } else {\n    return [input.videoHeight, input.videoWidth];\n  }\n}\n\nexport
function getInputSize(input: BodyPixInput): [number, number] {\n  if (((typeof (HTMLCanvasElement) !==
'undefined' &&\n    input instanceof HTMLCanvasElement) ||\n    (typeof (OffscreenCanvas) !== 'undefined'
&&\n    input instanceof OffscreenCanvas) ||\n    (typeof (HTMLImageElement) !== 'undefined' &&\n
input instanceof HTMLImageElement)) {\n    return getSizeFromImageLikeElement(input);\n  } else if (typeof
(ImageData) !== 'undefined' && input instanceof ImageData) {\n    return [input.height, input.width];\n  } else if (\n
    typeof (HTMLVideoElement) !== 'undefined' &&\n    input instanceof HTMLVideoElement) {\n    return
getSizeFromVideoElement(input);\n  } else if (input instanceof tf.Tensor) {\n    return [input.shape[0],
input.shape[1]]; \n  } else {\n    throw new Error(`error: Unknown input type: ${input}`);\n  }\n}\n\nfunction
isValidInputResolution(\n  resolution: number, outputStride: number): boolean {\n  return (resolution - 1) %
outputStride === 0;\n}\n\nexport function toValidInputResolution(\n  inputResolution: number, outputStride:
BodyPixOutputStride): number {\n  if (isValidInputResolution(inputResolution, outputStride)) {\n    return
inputResolution;\n  }\n  return Math.floor(inputResolution / outputStride) * outputStride + 1;\n}\n\nconst
INTERNAL_RESOLUTION_STRING_OPTIONS = {\n  low: 'low',\n  medium: 'medium',\n  high: 'high',\n  full:
'full'\n};\n\nconst INTERNAL_RESOLUTION_PERCENTAGES = {\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.low]: 0.25,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.medium]: 0.5,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.high]: 0.75,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.full]: 1.0\n};\n\nconst MIN_INTERNAL_RESOLUTION = 0.1;\nconst
MAX_INTERNAL_RESOLUTION = 2.0;\n\nfunction toInternalResolutionPercentage(\n  internalResolution: BodyPixInternalResolution): number {\n  if (typeof internalResolution === 'string') {\n    const
result = INTERNAL_RESOLUTION_PERCENTAGES[internalResolution];\n    tf.util.assert(\n    typeof result

```



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=== 'number',\n      () => `string value of inputResolution must be one of ${\n
Object.values(INTERNAL_RESOLUTION_STRING_OPTIONS)\n          .join(',') but was
${internalResolution}`);\n      return result;\n    } else {\n      tf.util.assert(\n        typeof internalResolution === 'number'
&&\n        internalResolution <= MAX_INTERNAL_RESOLUTION &&\n        internalResolution >=
MIN_INTERNAL_RESOLUTION,\n      () =>{\n        `inputResolution must be a string or number between ${\n
MIN_INTERNAL_RESOLUTION} and ${MAX_INTERNAL_RESOLUTION}, but ` +\n          `was
${internalResolution}`);\n      }\n    }\n  }\n\n  export function
toInputResolutionHeightAndWidth(\n    internalResolution: BodyPixInternalResolution,\n    outputStride:
BodyPixOutputStride,\n    [inputHeight, inputWidth]: [number, number]): [number, number] {\n    const
internalResolutionPercentage =\n      toInternalResolutionPercentage(internalResolution);\n    return [\n
toValidInputResolution(\n      inputHeight * internalResolutionPercentage, outputStride),\n
toValidInputResolution(\n      inputWidth * internalResolutionPercentage, outputStride)\n    ];\n  }\n\n  export function
toInputTensor(input: BodyPixInput) {\n    // TODO: tf.browser.fromPixels types to support OffscreenCanvas\n    //
@ts-ignore\n    return input instanceof tf.Tensor ? input : tf.browser.fromPixels(input);\n  }\n\n  export function
resizeAndPadTo(\n    imageTensor: tf.Tensor3D, [targetH, targetW]: [number, number],\n    flipHorizontal = false):
{\n    resizedAndPadded: tf.Tensor3D,\n    paddedBy: [[number, number], [number, number]]\n  } {\n    const [height,
width] = imageTensor.shape;\n    const targetAspect = targetW / targetH;\n    const aspect = width / height;\n    let
resizeW: number;\n    let resizeH: number;\n    let padL: number;\n    let padR: number;\n    let padT: number;\n    let
padB: number;\n    if (aspect > targetAspect) {\n      // resize to have the larger dimension match the shape.\n
resizeW = targetW;\n      resizeH = Math.ceil(resizeW / aspect);\n      const padHeight = targetH - resizeH;\n      padL
= 0;\n      padR = 0;\n      padT = Math.floor(padHeight / 2);\n      padB = targetH - (resizeH + padT);\n    } else {\n
resizeH = targetH;\n      resizeW = Math.ceil(targetH * aspect);\n      const padWidth = targetW - resizeW;\n      padL
= Math.floor(padWidth / 2);\n      padR = targetW - (resizeW + padL);\n      padT = 0;\n      padB = 0;\n    }\n    const
resizedAndPadded = tf.tidy(() => {\n      // resize to have largest dimension match image\n      let resized:
tf.Tensor3D;\n      if (flipHorizontal) {\n        resized = tf.image.resizeBilinear(\n          tf.reverse(imageTensor, 1),
[resizeH, resizeW]);\n      } else {\n        resized = tf.image.resizeBilinear(imageTensor, [resizeH, resizeW]);\n      }\n
const padded = tf.pad3d(resized, [[padT, padB], [padL, padR], [0, 0]]);\n      return padded;\n    });\n    return
{resizedAndPadded, paddedBy: [[padT, padB], [padL, padR]]};\n  }\n\n  export function
scaleAndCropToInputTensorShape(\n    tensor: tf.Tensor3D,\n    [inputTensorHeight, inputTensorWidth]: [number,
number],\n    [resizedAndPaddedHeight, resizedAndPaddedWidth]: [number, number],\n    [[padT, padB], [padL,
padR]]: [[number, number], [number, number]],\n    applySigmoidActivation = false): tf.Tensor3D {\n    return
tf.tidy(() => {\n      let inResizedAndPadded: tf.Tensor3D = tf.image.resizeBilinear(tensor,\n
[resizedAndPaddedHeight, resizedAndPaddedWidth], true);\n      if (applySigmoidActivation) {\n
inResizedAndPadded = tf.sigmoid(inResizedAndPadded);\n      }\n      return removePaddingAndResizeBack(\n
inResizedAndPadded, [inputTensorHeight, inputTensorWidth],\n        [[padT, padB], [padL, padR]]);\n    });\n  }\n\n  export function removePaddingAndResizeBack(\n    resizedAndPadded: tf.Tensor3D,\n    [originalHeight,
originalWidth]: [number, number],\n    [[padT, padB], [padL, padR]]: [[number, number], [number, number]]):\n
tf.Tensor3D {\n    return tf.tidy(() => {\n      const batchedImage: tf.Tensor4D = tf.expandDims(resizedAndPadded);\n
return tf.squeeze(tf.image\n        .cropAndResize(\n          batchedImage, [[\n            padT / (originalHeight +
padT + padB - 1.0),\n            padL / (originalWidth + padL + padR - 1.0),\n            (padT + originalHeight - 1.0)
/\n            (originalHeight + padT + padB - 1.0),\n            (padL + originalWidth - 1.0) / (originalWidth + padL
+ padR - 1.0)\n          ]),\n          [0, [originalHeight, originalWidth], [0]]);\n    });\n  }\n\n  export function resize2d(\n
tensor: tf.Tensor2D, resolution: [number, number],\n    nearestNeighbor?: boolean): tf.Tensor2D {\n    return
tf.tidy(() => {\n      const batchedImage: tf.Tensor4D = tf.expandDims(tensor, 2);\n      return tf.squeeze(\n
tf.image.resizeBilinear(batchedImage, resolution, nearestNeighbor));\n    });\n  }\n\n  export function
padAndResizeTo(\n    input: BodyPixInput, [targetH, targetW]: [number, number]):\n    {\n      resized: tf.Tensor3D,\n      padding: Padding\n    } {\n    const [height, width] = getInputSize(input);\n    const targetAspect = targetW / targetH;\n
const aspect = width / height;\n    let [padT, padB, padL, padR] = [0, 0, 0, 0];\n    if (aspect < targetAspect) {\n      //

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pads the width\n  padT = 0;\n  padB = 0;\n  padL = Math.round(0.5 * (targetAspect * height - width));\n  padR
= Math.round(0.5 * (targetAspect * height - width));\n } else {\n // pads the height\n  padT = Math.round(0.5 *
((1.0 / targetAspect) * width - height));\n  padB = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n
padL = 0;\n  padR = 0;\n }\n\n const resized: tf.Tensor3D = tf.tidy(() => {\n  let imageTensor =
toInputTensor(input);\n  imageTensor = tf.pad3d(imageTensor, [[padT, padB], [padL, padR], [0, 0]]);\n\n  return
tf.image.resizeBilinear(imageTensor, [targetH, targetW]);\n });\n\n return {resized, padding: {top: padT, left: padL,
right: padR, bottom: padB}};\n}\n\n\nexport async function toTensorBuffers3D(tensors: tf.Tensor3D[]):\nPromise<TensorBuffer3D[]> {\n  return Promise.all(tensors.map(tensor => tensor.buffer()));\n}\n\n\nexport function
scalePose(\n  pose: Pose, scaleY: number, scaleX: number, offsetY = 0,\n  offsetX = 0): Pose {\n  return {\n    score: pose.score,\n    keypoints: pose.keypoints.map(({score, part, position}) => ({\n      score,\n      part,\n      position: {\n        x: position.x * scaleX +
offsetX,\n        y: position.y * scaleY + offsetY\n      }\n    })))\n  };\n}\n\n\nexport function scalePoses(\n  poses: Pose[], scaleY: number, scaleX: number, offsetY = 0, offsetX
= 0) {\n  if (scaleX === 1 && scaleY === 1 && offsetY === 0 && offsetX === 0) {\n    return poses;\n  }\n  return
poses.map(pose => scalePose(pose, scaleY, scaleX, offsetY, offsetX));\n}\n\n\nexport function
flipPoseHorizontal(pose: Pose, imageWidth: number): Pose {\n  return {\n    score: pose.score,\n    keypoints:
pose.keypoints.map(\n      ({score, part, position}) => ({\n        score,\n        part,\n        position: {x:
imageWidth - 1 - position.x, y: position.y}\n      })\n    );\n  };\n}\n\n\nexport function flipPosesHorizontal(poses: Pose[],
imageWidth: number) {\n  if (imageWidth <= 0) {\n    return poses;\n  }\n  return poses.map(pose =>
flipPoseHorizontal(pose, imageWidth));\n}\n\n\nexport function scaleAndFlipPoses(\n  poses: Pose[], [height,
width]: [number, number],\n  [inputResolutionHeight, inputResolutionWidth]: [number, number],\n  padding:
Padding, flipHorizontal: boolean): Pose[] {\n  const scaleY =\n    (height + padding.top + padding.bottom) /
(inputResolutionHeight);\n  const scaleX =\n    (width + padding.left + padding.right) /
(inputResolutionWidth);\n\n  const scaledPoses =\n    scalePoses(poses, scaleY, scaleX, -padding.top, -
padding.left);\n\n  if (flipHorizontal) {\n    return flipPosesHorizontal(scaledPoses, width);\n  } else {\n    return
scaledPoses;\n  }\n}\n\n", "\n/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport
{BaseModel} from './base_model';\nimport {decodeOnlyPartSegmentation, decodePartSegmentation,
toMaskTensor} from './decode_part_map';\nimport {MobileNet} from './mobilenet';\nimport
{decodePersonInstanceMasks, decodePersonInstancePartMasks} from
'/multi_person/decode_instance_masks';\nimport {decodeMultiplePoses} from
'/multi_person/decode_multiple_poses';\nimport {ResNet} from './resnet';\nimport {mobileNetSavedModel,
resNet50SavedModel} from './saved_models';\nimport {BodyPixArchitecture, BodyPixInput,
BodyPixInternalResolution, BodyPixMultiplier, BodyPixOutputStride, BodyPixQuantBytes, Padding} from
'/types';\nimport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation,
SemanticPersonSegmentation} from './types';\nimport {getInputSize, padAndResizeTo,
scaleAndCropToInputTensorShape, scaleAndFlipPoses, toInputResolutionHeightAndWidth, toTensorBuffers3D}
from './util';\n\nconst APPLY_SIGMOID_ACTIVATION = true;\nconst FLIP_POSES_AFTER_SCALING =
false;\n\n/**\n * BodyPix model loading is configurable using the following config dictionary.\n *\n *
`architecture`: BodyPixArchitecture. It determines which BodyPix architecture\n * to load. The supported
architectures are: MobileNetV1 and ResNet50.\n *\n * `outputStride`: Specifies the output stride of the BodyPix

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model.
 * The smaller the value, the larger the output resolution, and more accurate
 * the model at the cost of speed. Set this to a larger value to increase speed
 * at the cost of accuracy. Stride 32 is supported for ResNet and
 * stride 8,16,32 are supported for various MobileNetV1 models.
 * `multiplier`: An optional number with values: 1.01, 1.0, 0.75, or
 * 0.50. The value is used only by MobileNet architecture. It is the float
 * multiplier for the depth (number of channels) for all convolution ops.
 * The larger the value, the larger the size of the layers, and more accurate
 * the model at the cost of speed. Set this to a smaller value to increase speed
 * at the cost of accuracy.
 * `modelUrl`: An optional string that specifies custom url of the model. This
 * is useful for area/countries that don't have access to the model hosted on
 * GCP.
 * `quantBytes`: An optional number with values: 1, 2, or 4. This parameter
 * affects weight quantization in the models. The available options are
 * 1 byte, 2 bytes, and 4 bytes. The higher the value, the larger the model size
 * and thus the longer the loading time, the lower the value, the shorter the
 * loading time but lower the accuracy.
 * export interface ModelConfig {
 architecture: BodyPixArchitecture;
 outputStride: BodyPixOutputStride;
 multiplier?: BodyPixMultiplier;
 modelUrl?: string;
 quantBytes?: BodyPixQuantBytes; }
 // The default configuration for loading MobileNetV1 based BodyPix.
 // (And for references, the default configuration for loading ResNet based
 PoseNet is also included).
 const RESNET_CONFIG = {
 architecture: 'ResNet50',
 outputStride: 32,
 quantBytes: 4, } as ModelConfig;
 const MOBILENET_V1_CONFIG = {
 architecture: 'MobileNetV1',
 outputStride: 16,
 quantBytes: 4,
 multiplier: 0.75, } as ModelConfig;
 const VALID_ARCHITECTURE: BodyPixArchitecture[] = ['MobileNetV1', 'ResNet50'];
 const VALID_STRIDE: { [id: string]: BodyPixOutputStride[] } = {
 'MobileNetV1': [8, 16, 32],
 'ResNet50': [32, 16] };
 const VALID_MULTIPLIER: { [id: string]: BodyPixMultiplier[] } = {
 'MobileNetV1': [0.50, 0.75, 1.0],
 'ResNet50': [1.0] };
 const VALID_QUANT_BYTES: BodyPixQuantBytes[] = [1, 2, 4];
 function validateModelConfig(config: ModelConfig): ModelConfig {
 config = config || MOBILENET_V1_CONFIG;
 if (config.architecture == null) {
 config.architecture = 'MobileNetV1'; }
 if (VALID_ARCHITECTURE.indexOf(config.architecture) < 0) {
 throw new Error(`Invalid architecture \${config.architecture}.` +
 `Should be one of \${VALID_ARCHITECTURE}`); }
 if (config.outputStride == null) {
 config.outputStride = 16; }
 if (VALID_STRIDE[config.architecture].indexOf(config.outputStride) < 0) {
 throw new Error(`Invalid outputStride \${config.outputStride}.` +
 `Should be one of \${VALID_STRIDE[config.architecture]}` +
 `for architecture \${config.architecture}.`); }
 if (config.multiplier == null) {
 config.multiplier = 1.0; }
 if (VALID_MULTIPLIER[config.architecture].indexOf(config.multiplier) < 0) {
 throw new Error(`Invalid multiplier \${config.multiplier}.` +
 `Should be one of \${VALID_MULTIPLIER[config.architecture]}` +
 `for architecture \${config.architecture}.`); }
 if (config.quantBytes == null) {
 config.quantBytes = 4; }
 if (VALID_QUANT_BYTES.indexOf(config.quantBytes) < 0) {
 throw new Error(`Invalid quantBytes \${config.quantBytes}.` +
 `Should be one of \${VALID_QUANT_BYTES}` +
 `for architecture \${config.architecture}.`); }
 }
 return config; }
 * BodyPix inference is configurable using the following config dictionary.
 * `flipHorizontal`: If the left-right keypoint of poses/part segmentation
 * should be flipped/mirrored horizontally. This should be set to true for
 * videos where the video is by default flipped horizontally (i.e. a webcam),
 * and you want the person & body part segmentation to be returned in the proper
 * orientation.
 * `internalResolution`: Defaults to 'medium'. The internal resolution
 * percentage that the input is resized to before inference. The larger the
 * internalResolution the more accurate the model at the cost of slower
 * prediction times. Available values are 'low', 'medium', 'high', 'full', or a
 * percentage value between 0 and 1. The values 'low', 'medium', 'high', and
 * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.
 * `segmentationThreshold`: The minimum that segmentation values must
 * have to be considered part of the person. Affects the generation of the
 * segmentation mask. More specifically, it is the threshold used to binarize
 * the intermediate person segmentation probability. The probability of each
 * pixel belongs to a person is in range [0, 1]. If the probability is greater
 * than the `segmentationThreshold`, it will be set to 1 otherwise 0.
 * export interface InferenceConfig {
 flipHorizontal?: boolean;
 internalResolution?: BodyPixInternalResolution; }

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segmentationThreshold?: number;\n}\n\n/**\n * Person Inference Config\n *\n * `maxDetections`: Defaults to 10. Maximum number of person pose detections per\n * image.\n *\n * `scoreThreshold`: Defaults to 0.4. Only return person pose that have root\n * part score greater or equal to this value.\n *\n * `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels.\n * It needs to be strictly positive. Two pose keypoints suppress each other if\n * they are less than `nmsRadius` pixels away.\n */\nexport interface PersonInferenceConfig extends InferenceConfig {\n  maxDetections?: number;\n  scoreThreshold?: number;\n  nmsRadius?: number;\n}\n\n/**\n * Multiple Person Instance Inference Config\n *\n * `maxDetections`: Defaults to 10. Maximum number of returned instance\n * segmentation and pose detections per image.\n *\n * `scoreThreshold`: Defaults to 0.4. Only returns and uses person\n * poses for instance segmentation assignment when the pose has root part score\n * greater or equal to this value.\n *\n * `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels.\n * It needs to be strictly positive. Two parts suppress each other if they are\n * less than `nmsRadius` pixels away.\n *\n * `minKeypointScore`: Default to 0.3. Keypoints above the score are used\n * for matching and assigning segmentation mask to each person.\n *\n * `refineSteps`: Default to 10. The number of refinement steps used when\n * assigning the instance segmentation. It needs to be strictly positive. The\n * larger the higher the accuracy and slower the inference.\n */\nexport interface MultiPersonInstanceInferenceConfig extends InferenceConfig {\n  maxDetections?: number;\n  scoreThreshold?: number;\n  nmsRadius?: number;\n  minKeypointScore?: number;\n  refineSteps?: number;\n}\n\nexport const PERSON_INFERENCE_CONFIG: PersonInferenceConfig = {\n  flipHorizontal: false,\n  internalResolution: 'medium',\n  segmentationThreshold: 0.7,\n  maxDetections: 10,\n  scoreThreshold: 0.4,\n  nmsRadius: 20,\n};\n\nexport const MULTI_PERSON_INSTANCE_INFERENCE_CONFIG: MultiPersonInstanceInferenceConfig = {\n  flipHorizontal: false,\n  internalResolution: 'medium',\n  segmentationThreshold: 0.7,\n  maxDetections: 10,\n  scoreThreshold: 0.4,\n  nmsRadius: 20,\n  minKeypointScore: 0.3,\n  refineSteps: 10\n};\n\nfunction validatePersonInferenceConfig(config: PersonInferenceConfig) {\n  const {segmentationThreshold, maxDetections, scoreThreshold, nmsRadius} =\n    config;\n  if (segmentationThreshold < 0.0 ||\n      segmentationThreshold > 1.0) {\n    throw new Error(\n      `segmentationThreshold ${segmentationThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n  if (maxDetections <= 0) {\n    throw new Error(\n      `Invalid maxDetections ${maxDetections}. ` +\n      `Should be > 0`);\n  }\n  if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {\n    throw new Error(\n      `Invalid scoreThreshold ${scoreThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n  if (nmsRadius <= 0) {\n    throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n  }\n}\n\nfunction validateMultiPersonInstanceInferenceConfig(\n  config: MultiPersonInstanceInferenceConfig) {\n  const {\n    segmentationThreshold,\n    maxDetections,\n    scoreThreshold,\n    nmsRadius,\n    minKeypointScore,\n    refineSteps\n  } = config;\n  if (segmentationThreshold < 0.0 || segmentationThreshold > 1.0) {\n    throw new Error(\n      `segmentationThreshold ${segmentationThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n  if (maxDetections <= 0) {\n    throw new Error(\n      `Invalid maxDetections ${maxDetections}. ` +\n      `Should be > 0`);\n  }\n  if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {\n    throw new Error(\n      `Invalid scoreThreshold ${scoreThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n  if (nmsRadius <= 0) {\n    throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n  }\n  if (minKeypointScore < 0 || minKeypointScore > 1) {\n    throw new Error(\n      `Invalid minKeypointScore ${minKeypointScore}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n  if (refineSteps <= 0 || refineSteps > 20) {\n    throw new Error(\n      `Invalid refineSteps ${refineSteps}. ` +\n      `Should be in range [1, 20]`);\n  }\n}\n\nexport class BodyPix {\n  baseModel: BaseModel;\n\n  constructor(net: BaseModel) {\n    this.baseModel = net;\n  }\n\n  private\n  predictForPersonSegmentation(input: tf.Tensor3D): {\n    segmentLogits: tf.Tensor3D,\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n  } {\n    const {\n      segmentation,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n    } = this.baseModel.predict(input);\n    return {\n      segmentLogits: segmentation,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n    };\n  }\n\n  private\n  predictForPersonSegmentationAndPart(input: tf.Tensor3D): {\n    segmentLogits: tf.Tensor3D,\n    partHeatmapLogits: tf.Tensor3D,\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd:

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tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n } {\n const {\n segmentation,\n partHeatmaps,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = this.baseModel.predict(input);\n return {\n segmentLogits: segmentation,\n partHeatmapLogits: partHeatmaps,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n };\n }\n\n private\n predictForMultiPersonInstanceSegmentationAndPart(input: tf.Tensor3D):\n {\n segmentLogits:\n tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D\n } {\n const {\n segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n partHeatmaps,\n } = this.baseModel.predict(input);\n return {\n segmentLogits:\n segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n partHeatmaps\n };\n }\n\n /**\n * Given an image with people, returns a dictionary of all intermediate\n * tensors including: 1) a binary array with 1 for the pixels that are part of\n * the person, and 0 otherwise, 2)\n heatmapScores, 3) offsets, and 4) paddings.\n *\n * @param input\n ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed\n through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal resolution\n * that\n the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the\n cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n * a percentage value\n between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n *\n * @param segmentationThreshold The minimum that segmentation values must have\n * to be considered\n part of the person. Affects the generation of the\n * segmentation mask.\n *\n * @return A dictionary containing\n `segmentation`, `heatmapScores`, `offsets`,\n * and `padding`:\n * - `segmentation`: A 2d Tensor with 1 for the\n pixels that are part of the\n * person, and 0 otherwise. The width and height correspond to the same\n * dimensions of the input image.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * pose\n estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by pose\n * estimation decoding.\n * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement used\n * by pose estimation decoding.\n * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n * by pose estimation\n decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n * before it is fed into the\n model.\n */\n segmentPersonActivation(\n input: BodyPixInput, internalResolution:\n BodyPixInternalResolution,\n segmentationThreshold = 0.5): {\n segmentation: tf.Tensor2D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd:\n tf.Tensor3D,\n padding: Padding,\n internalResolutionHeightAndWidth: [number, number]\n } {\n const\n [height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth =\n toInputResolutionHeightAndWidth(\n internalResolution, this.baseModel.outputStride, [height, width]);\n const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = tf.tidy(() =>\n {\n const {\n segmentLogits,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = this.predictForPersonSegmentation(resized);\n const [resizedHeight, resizedWidth]\n = resized.shape;\n const scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits,\n [height, width], [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left,\n padding.right]]),\n APPLY_SIGMOID_ACTIVATION);\n return {\n segmentation: toMaskTensor(\n tf.squeeze(scaledSegmentScores), segmentationThreshold),\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n };\n });\n resized.dispose();\n return {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n };\n }\n\n /**\n * Given an image with many people, returns a\n PersonSegmentation dictionary\n * that contains the segmentation mask for all people and a single pose.\n *\n * Note: The segmentation mask returned by this method covers all people but\n * the pose works well for one\n person. If you want to estimate instance-level\n * multiple person segmentation & pose for each person, use\n * `segmentMultiPerson`\n instead.\n *\n * @param input

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ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed through the network.\n *\n * @param config PersonInferenceConfig object that contains\n * parameters for the BodyPix inference using person decoding.\n *\n * @return A SemanticPersonSegmentation dictionary that contains height,\n * width, the flattened binary segmentation mask and the poses for all people.\n * The width and height correspond to the same dimensions of the input image.\n * - `height`: The height of the segmentation data in pixel unit.\n * - `width`: The width of the segmentation data in pixel unit.\n * - `data`: The flattened Uint8Array of segmentation data. 1 means the pixel\n * belongs to a person and 0 means the pixel doesn't belong to a person. The\n * size of the array is equal to `height` x `width` in row-major order.\n * - `allPoses`: The 2d poses of all people.\n */\n async segmentPerson(\n input: BodyPixInput,\n config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n Promise<SemanticPersonSegmentation> {\n config = {...PERSON_INFERENCE_CONFIG, ...config};\n validatePersonInferenceConfig(config);\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n } =\n this.segmentPersonActivation(\n input,\n config.internalResolution, config.segmentationThreshold);\n const [height, width] = segmentation.shape;\n const result = await segmentation.data() as Uint8Array;\n segmentation.dispose();\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScores, offsets, displacementFwd, displacementBwd]);\n const [scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n let poses = decodeMultiplePoses(\n scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n poses = scaleAndFlipPoses(\n poses, [height, width], internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n heatmapScores.dispose();\n offsets.dispose();\n displacementFwd.dispose();\n displacementBwd.dispose();\n return {height, width, data: result, allPoses: poses};\n }\n /**\n * Given an image with multiple people, returns an *array* of\n * PersonSegmentation object. Each element in the array corresponding to one\n * of the people in the input image. In other words, it predicts\n * instance-level multiple person segmentation & pose for each person.\n *\n * The model does standard ImageNet pre-processing before inferring through\n * the model. The image pixels should have values [0-255].\n *\n * @param input\n * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement\n The input\n * image to feed through the network.\n *\n * @param config MultiPersonInferenceConfig object that contains\n * parameters for the BodyPix inference using multi-person decoding.\n *\n * @return An array of PersonSegmentation object, each containing a width,\n * height, a binary array (1 for the pixels that are part of the\n * person, and 0 otherwise) and 2D pose. The array size corresponds to the\n * number of pixels in the image. The width and height correspond to the\n * dimensions of the image the binary array is shaped to, which are the same\n * dimensions of the input image.\n */\n async segmentMultiPerson(\n input: BodyPixInput,\n config: MultiPersonInstanceInferenceConfig = MULTI_PERSON_INSTANCE_INFERENCE_CONFIG):\n Promise<PersonSegmentation[]> {\n config = {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n validateMultiPersonInstanceInferenceConfig(config);\n const [height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n config.internalResolution, this.baseModel.outputStride,\n [height, width]);\n const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n const {\n segmentation,\n longOffsets,\n heatmapScoresRaw,\n offsetsRaw,\n displacementFwdRaw,\n displacementBwdRaw,\n } = tf.tidy(() => {\n const {\n segmentLogits,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n } =\n this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n const scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits, [height, width], internalResolutionHeightAndWidth,\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n const longOffsetsResized = false;\n let scaledLongOffsets;\n if (longOffsetsResized) {\n scaledLongOffsets = scaleAndCropToInputTensorShape(\n longOffsets, [height, width],\n internalResolutionHeightAndWidth,\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n

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APPLY_SIGMOID_ACTIVATION);\n    } else {\n        scaledLongOffsets = longOffsets;\n    }\n\n    const\n    segmentation = toMaskTensor(\n        tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n\n    return {\n        segmentation,\n        longOffsets: scaledLongOffsets,\n        heatmapScoresRaw: heatmapScores,\n        offsetsRaw: offsets,\n        displacementFwdRaw: displacementFwd,\n        displacementBwdRaw:\n        displacementBwd,\n    };\n\n    const tensorBuffers = await toTensorBuffers3D(\n        [heatmapScoresRaw,\n        offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n    const [scoresBuf, offsetsBuf,\n        displacementsFwdBuf, displacementsBwdBuf] =\n        tensorBuffers;\n\n    let poses = decodeMultiplePoses(\n        scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n        this.baseModel.outputStride,\n        config.maxDetections,\n        config.scoreThreshold, config.nmsRadius);\n\n    poses = scaleAndFlipPoses(\n        poses, [height, width], internalResolutionHeightAndWidth, padding,\n        FLIP_POSES_AFTER_SCALING);\n\n    const instanceMasks = await decodePersonInstanceMasks(\n        segmentation, longOffsets, poses, height, width,\n        this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n        config.scoreThreshold,\n        config.refineSteps, config.minKeypointScore,\n        config.maxDetections);\n\n    resized.dispose();\n    segmentation.dispose();\n    longOffsets.dispose();\n    heatmapScoresRaw.dispose();\n    offsetsRaw.dispose();\n    displacementFwdRaw.dispose();\n    displacementBwdRaw.dispose();\n\n    return instanceMasks;\n}\n\n/**\n * Given an image with many people, returns a dictionary containing: height,\n * width, a tensor with a part id from 0-24 for the pixels that are\n * part of a corresponding body part, and -1 otherwise. This does standard\n * ImageNet pre-processing before inferring through the model. The image\n * should have values [0-255].\n * @param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement\n * The input image to feed through the network.\n * @param internalResolution Defaults to 'medium'. The internal\n * resolution percentage that the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the cost of slower\n * prediction times. Available values are 'low', 'medium', 'high',\n * 'full', or a percentage value between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n * @param segmentationThreshold The minimum that segmentation values\n * must have to be considered part of the person. Affects the clipping of the colored\n * part image.\n * @return A dictionary containing `partSegmentation`, `heatmapScores`,\n * `offsets`, and `padding`:\n * - `partSegmentation`: A 2d Tensor with a part id from 0-24 for\n * the pixels that are part of a corresponding body part, and -1 otherwise.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * single-person pose estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by single-person pose\n * estimation decoding.\n * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement\n * used by pose estimation decoding.\n * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n * by pose estimation decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n * before it is fed into the model.\n */\nsegmentPersonPartsActivation(\n    input: BodyPixInput,\n    internalResolution: BodyPixInternalResolution,\n    segmentationThreshold = 0.5): {\n    partSegmentation: tf.Tensor2D,\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n    padding: Padding,\n    internalResolutionHeightAndWidth: [number, number]\n}\n\nconst [height, width] = getInputSize(input);\nconst internalResolutionHeightAndWidth =\n    toInputResolutionHeightAndWidth(\n        internalResolution, this.baseModel.outputStride, [height, width]);\nconst {\n    resized,\n    padding,\n} = padAndResizeTo(input, internalResolutionHeightAndWidth);\n\nconst {\n    partSegmentation,\n    heatmapScores,\n    offsets,\n    displacementFwd,\n    displacementBwd\n} =\n    tf.tidy(() => {\n        const {\n            segmentLogits,\n            partHeatmapLogits,\n            heatmapScores,\n            offsets,\n            displacementFwd,\n            displacementBwd\n        } = this.predictForPersonSegmentationAndPart(resized);\n\n        const [resizedHeight, resizedWidth] = resized.shape;\n        const scaledSegmentScores =\n            scaleAndCropToInputTensorShape(\n                segmentLogits, [height, width], [resizedHeight, resizedWidth],\n                [[padding.top, padding.bottom], [padding.left, padding.right]],\n                APPLY_SIGMOID_ACTIVATION);\n\n        const scaledPartHeatmapScore = scaleAndCropToInputTensorShape(\n            partHeatmapLogits, [height, width],\n            [resizedHeight, resizedWidth],\n            [[padding.top, padding.bottom], [padding.left, padding.right]],\n            APPLY_SIGMOID_ACTIVATION);\n        const segmentation =\n
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toMaskTensor(tf.squeeze(scaledSegmentScores), segmentationThreshold);\n return {\n partSegmentation:\n decodePartSegmentation(segmentation, scaledPartHeatmapScore),\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n };\n });\n resized.dispose();\n return {\n partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n };\n }\n\n /**\n * Given an image with many people,  
returns a PartSegmentation dictionary that\n * contains the body part segmentation mask for all people and a single  
pose.\n *\n * Note: The body part segmentation mask returned by this method covers all\n * people but the pose  
works well when there is one person. If you want to\n * estimate instance-level multiple person body part  
segmentation & pose for\n * each person, use `segmentMultiPersonParts` instead.\n *\n * @param input  
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed  
through the network.\n *\n * @param config PersonInferenceConfig object that contains\n * parameters for the  
BodyPix inference using single person decoding.\n *\n * @return A SemanticPartSegmentation dictionary that  
contains height, width,\n * the flattened binary segmentation mask and the pose for the person. The\n * width and  
height correspond to the same dimensions of the input image.\n * - `height`: The height of the person part  
segmentation data in pixel unit.\n * - `width`: The width of the person part segmentation data in pixel unit.\n * -  
`data`: The flattened Int32Array of person part segmentation data with a\n * part id from 0-24 for the pixels that are  
part of a corresponding body\n * part, and -1 otherwise. The size of the array is equal to `height` x\n * `width` in  
row-major order.\n * - `allPoses`: The 2d poses of all people.\n */\n\n ^/\n async segmentPersonParts(\n input:  
BodyPixInput,\n config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n Promise<SemanticPartSegmentation> {\n config = {...PERSON_INFERENCE_CONFIG, ...config};\n validatePersonInferenceConfig(config);\n const {\n partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n } =\n this.segmentPersonPartsActivation(\n input, config.internalResolution, config.segmentationThreshold);\n const [height, width] = partSegmentation.shape;\n const data = await partSegmentation.data() as Int32Array;\n partSegmentation.dispose();\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScores, offsets,  
displacementFwd, displacementBwd]);\n const [scoresBuf, offsetsBuf, displacementsFwdBuf,  
displacementsBwdBuf] =\n tensorBuffers;\n let poses = decodeMultiplePoses(\n scoresBuf, offsetsBuf,  
displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n poses = scaleAndFlipPoses(\n poses, [height, width],  
internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n heatmapScores.dispose();\n offsets.dispose();\n displacementFwd.dispose();\n displacementBwd.dispose();\n return {height, width, data, allPoses: poses};\n }\n\n /**\n * Given an image with multiple people, returns an  
*array* of PartSegmentation\n * object. Each element in the array corresponding to one\n * of the people in the  
input image. In other words, it predicts\n * instance-level multiple person body part segmentation & pose for  
each\n * person.\n *\n * This does standard ImageNet pre-processing before inferring through\n * the model.  
The image pixels should have values [0-255].\n *\n * @param input\n *  
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n * image to feed  
through the network.\n *\n * @param config MultiPersonInferenceConfig object that contains\n * parameters for the  
BodyPix inference using multi-person decoding.\n *\n * @return An array of PartSegmentation object, each  
containing a width,\n * height, a flattened array (with part id from 0-24 for the pixels that are\n * part of a  
corresponding body part, and -1 otherwise) and 2D pose. The width\n * and height correspond to the dimensions of  
the image. Each flattened part\n * segmentation array size is equal to `height` x `width`.\n */\n\n ^/\n async segmentMultiPersonParts(\n input: BodyPixInput,\n config: MultiPersonInstanceInferenceConfig =\n MULTI_PERSON_INSTANCE_INFERENCE_CONFIG): Promise<PartSegmentation[]> {\n config =  
{...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n validateMultiPersonInstanceInferenceConfig(config);\n const [height, width] = getInputSize(input);\n const  
internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n config.internalResolution,  
this.baseModel.outputStride,\n [height, width]);\n const {resized, padding} =\n padAndResizeTo(input,

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internalResolutionHeightAndWidth);\n const {\n  segmentation,\n  longOffsets,\n  heatmapScoresRaw,\n  offsetsRaw,\n  displacementFwdRaw,\n  displacementBwdRaw,\n  partSegmentation,\n  } = tf.tidy(() =>
{\n  const {\n    segmentLogits,\n    longOffsets,\n    heatmapScores,\n    offsets,\n    displacementFwd,\n    displacementBwd,\n    partHeatmaps\n  } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n\n  // decoding with scaling.\n  const
scaledSegmentScores = scaleAndCropToInputTensorShape(\n    segmentLogits, [height, width],
internalResolutionHeightAndWidth,\n    [[padding.top, padding.bottom], [padding.left, padding.right]],\n    APPLY_SIGMOID_ACTIVATION);\n\n  // decoding with scaling.\n  const scaledPartSegmentationScores =
scaleAndCropToInputTensorShape(\n    partHeatmaps, [height, width], internalResolutionHeightAndWidth,\n    [[padding.top, padding.bottom], [padding.left, padding.right]],\n    APPLY_SIGMOID_ACTIVATION);\n\n  const scaledLongOffsets = longOffsets;\n  const segmentation = toMaskTensor(\n
tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n  const partSegmentation =\n  decodeOnlyPartSegmentation(scaledPartSegmentationScores);\n  return {\n    segmentation,\n    longOffsets:
scaledLongOffsets,\n    heatmapScoresRaw: heatmapScores,\n    offsetsRaw: offsets,\n    displacementFwdRaw: displacementFwd,\n    displacementBwdRaw: displacementBwd,\n    partSegmentation\n  };\n });\n\n const tensorBuffers = await toTensorBuffers3D(\n  [heatmapScoresRaw,
offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n  const [scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf] =\n  tensorBuffers;\n\n  let poses = decodeMultiplePoses(\n
scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n  this.baseModel.outputStride,
config.maxDetections,\n  config.scoreThreshold, config.nmsRadius);\n\n  poses = scaleAndFlipPoses(\n
poses, [height, width], internalResolutionHeightAndWidth, padding,\n  FLIP_POSES_AFTER_SCALING);\n\n  const instanceMasks = await decodePersonInstancePartMasks(\n
segmentation, longOffsets, partSegmentation,
poses, height, width,\n  this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n
config.scoreThreshold, config.refineSteps, config.minKeypointScore,\n  config.maxDetections);\n\n  resized.dispose();\n  segmentation.dispose();\n  longOffsets.dispose();\n  heatmapScoresRaw.dispose();\n
offsetsRaw.dispose();\n  displacementFwdRaw.dispose();\n  displacementBwdRaw.dispose();\n
partSegmentation.dispose();\n\n  return instanceMasks;\n }\n\n public dispose() {\n  this.baseModel.dispose();\n
}\n}\n\n/**\n * Loads the MobileNet BodyPix model.\n */\n\n async function loadMobileNet(config: ModelConfig):
Promise<BodyPix> {\n  const outputStride = config.outputStride;\n  const quantBytes = config.quantBytes;\n  const
multiplier = config.multiplier;\n  if (tf == null) {\n    throw new Error(\n      `Cannot find TensorFlow.js. If you are
using a <script> tag, please ` +\n      `also include @tensorflow/tfjs on the page before using this\n      model.`);\n  }\n\n  const url = mobileNetSavedModel(outputStride, multiplier, quantBytes);\n  const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n  const mobilenet = new MobileNet(graphModel, outputStride);\n  return new BodyPix(mobilenet);\n }\n\n /**\n * Loads the ResNet BodyPix model.\n */\n\n async function
loadResNet(config: ModelConfig): Promise<BodyPix> {\n  const outputStride = config.outputStride;\n  const
quantBytes = config.quantBytes;\n  if (tf == null) {\n    throw new Error(\n      `Cannot find TensorFlow.js. If you
are using a <script> tag, please ` +\n      `also include @tensorflow/tfjs on the page before using this\n      model.`);\n  }\n\n  const url = resNet50SavedModel(outputStride, quantBytes);\n  const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n  const resnet = new ResNet(graphModel, outputStride);\n  return
new BodyPix(resnet);\n }\n\n /**\n * Loads the BodyPix model instance from a checkpoint, with the ResNet\n * or
MobileNet architecture. The model to be loaded is configurable using the\n * config dictionary ModelConfig. Please
find more details in the\n * documentation of the ModelConfig.\n * @param config ModelConfig dictionary that
contains parameters for\n * the BodyPix loading process. Please find more details of each parameters\n * in the
documentation of the ModelConfig interface. The predefined\n * `MOBILENET_V1_CONFIG` and
`RESNET_CONFIG` can also be used as references\n * for defining your customized config.\n */\n\n export async
function load(config: ModelConfig = MOBILENET_V1_CONFIG): Promise<BodyPix> {\n  config =
validateModelConfig(config);\n  if (config.architecture === 'ResNet50') {\n    return loadResNet(config);\n  } else if
(config.architecture === 'MobileNetV1') {\n    return loadMobileNet(config);\n  } else {\n    return null;\n  }\n}

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*\\n\\n// method copied from bGluR in https://codepen.io/zhaojun/pen/zZmRQe\\nexport function cpuBlur(\\n  canvas: HTMLCanvasElement|OffscreenCanvas,\\n  image: HTMLImageElement|HTMLVideoElement|HTMLCanvasElement|OffscreenCanvas,\\n  blur: number) {\\n  const ctx = canvas.getContext('2d');\\n  let sum = 0;\\n  const delta = 5;\\n  const alphaLeft = 1 / (2 * Math.PI * delta * delta);\\n  const step = blur < 3 ? 1 : 2;\\n  for (let y = -blur; y <= blur; y += step) {\\n    for (let x = -blur; x <= blur; x += step) {\\n      const weight =\\n        alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta));\\n      sum += weight;\\n    }\\n  }\\n  for (let y = -blur; y <= blur; y += step) {\\n    for (let x = -blur; x <= blur; x += step) {\\n      ctx.globalAlpha = alphaLeft *\\n        Math.exp(-(x * x + y * y) / (2 * delta * delta)) / sum * blur;\\n      ctx.drawImage(image, x, y);\\n    }\\n  }\\n  ctx.globalAlpha = 1;\\n}\\n", "/*\\n * @license\\n * Copyright 2019 Google LLC. All Rights Reserved.\\n * Licensed under the Apache License, Version 2.0 (the \"License\");\\n * you may not use this file except in compliance with the License.\\n * You may obtain a copy of the License at\\n *\\n * http://www.apache.org/licenses/LICENSE-2.0\\n *\\n * Unless required by applicable law or agreed to in writing, software\\n * distributed under the License is distributed on an \"AS IS\" BASIS,\\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\\n * See the License for the specific language governing permissions and\\n * limitations under the License.\\n *
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*\\n\\nimport {cpuBlur} from './blur';\\nimport {Color, PartSegmentation, PersonSegmentation} from './types';\\nimport {SemanticPartSegmentation, SemanticPersonSegmentation} from './types';\\nimport {getInputSize} from './util';\\n\\nexport type Canvas = HTMLCanvasElement | OffscreenCanvas;\\n\\nconst offScreenCanvases: {[name: string]: Canvas} = {};\\n\\ntype ImageType = HTMLImageElement|HTMLVideoElement|Canvas;\\ntype HasDimensions = {\\n  width: number,\\n  height: number\\n};\\n\\nfunction isSafari() {\\n  return /^(?!chrome|android).*safari/i.test(navigator.userAgent);\\n}\\n\\nfunction assertSameDimensions(\\n  {width: widthA, height: heightA}: HasDimensions,\\n  {width: widthB, height: heightB}: HasDimensions, nameA: string,\\n  nameB: string) {\\n  if (widthA !== widthB || heightA !== heightB) {\\n    throw new Error(`error: dimensions must match. ${nameA} has dimensions ${widthA}x${heightA}, ${nameB} has dimensions ${widthB}x${heightB}`);\\n  }\\n}\\n\\nfunction flipCanvasHorizontal(canvas: Canvas) {\\n  const ctx = canvas.getContext('2d');\\n  ctx.scale(-1, 1);\\n  ctx.translate(-canvas.width, 0);\\n}\\n\\nfunction drawWithCompositing(\\n  ctx: CanvasRenderingContext2D|OffscreenCanvasRenderingContext2D,\\n  image: Canvas|ImageType,\\n  compositeOperation: string) {\\n  ctx.globalCompositeOperation = compositeOperation;\\n  ctx.drawImage(image, 0, 0);\\n}\\n\\nfunction createOffScreenCanvas(): Canvas {\\n  if (typeof document !== 'undefined') {\\n    return document.createElement('canvas');\\n  } else if (typeof OffscreenCanvas !== 'undefined') {\\n    return new OffscreenCanvas(0, 0);\\n  } else {\\n    throw new Error('Cannot create a canvas in this context');\\n  }\\n}\\n\\nfunction ensureOffscreenCanvasCreated(id: string): Canvas {\\n  if (!offScreenCanvases[id]) {\\n    offScreenCanvases[id] = createOffScreenCanvas();\\n  }\\n  return offScreenCanvases[id];\\n}\\n\\nfunction drawAndBlurImageOnCanvas(\\n  image: ImageType, blurAmount: number, canvas: Canvas) {\\n  const {height, width} = image;\\n  const ctx = canvas.getContext('2d');\\n  canvas.width = width;\\n  canvas.height = height;\\n  ctx.clearRect(0, 0, width, height);\\n  ctx.save();\\n  if (isSafari()) {\\n    cpuBlur(canvas, image, blurAmount);\\n  } else {\\n    // tslint:disable:no-any\\n    (ctx as any).filter = `blur(${blurAmount}px)`;\\n    ctx.drawImage(image, 0, 0, width, height);\\n  }\\n  ctx.restore();\\n}\\n\\nfunction drawAndBlurImageOnOffScreenCanvas(\\n  image: ImageType, blurAmount: number,\\n  offscreenCanvasName: string): Canvas {\\n  const canvas = ensureOffscreenCanvasCreated(offscreenCanvasName);\\n  if (blurAmount === 0) {\\n
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renderImageToCanvas(image, canvas);\n } else {\n  drawAndBlurImageOnCanvas(image, blurAmount, canvas);\n }\n return canvas;\n}\n\nfunction renderImageToCanvas(image: ImageType, canvas: Canvas) {\n  const {width, height} = image;\n  canvas.width = width;\n  canvas.height = height;\n  const ctx = canvas.getContext('2d');\n  ctx.drawImage(image, 0, 0, width, height);\n}\n\n/**\n * Draw an image on a canvas\n */\nfunction\nrenderImageDataToCanvas(image: ImageData, canvas: Canvas) {\n  canvas.width = image.width;\n  canvas.height = image.height;\n  const ctx = canvas.getContext('2d');\n  ctx.putImageData(image, 0, 0);\n}\n\nfunction\nrenderImageDataToOffScreenCanvas(\n  image: ImageData, canvasName: string): Canvas {\n  const canvas = ensureOffscreenCanvasCreated(canvasName);\n  renderImageDataToCanvas(image, canvas);\n  return canvas;\n}\n\n/**\n * Given the output from estimating multi-person segmentation, generates an\n * image with foreground and background color at each pixel determined by the\n * corresponding binary segmentation value at the pixel from the output. In\n * other words, pixels where there is a person will be colored with foreground\n * color and where there is not a person will be colored with background color.\n */\n * @param\n personOrPartSegmentation The output from\n * `segmentPerson`, `segmentMultiPerson`,\n * `segmentPersonParts` or `segmentMultiPersonParts`. They can\n * be SemanticPersonSegmentation object, an array of PersonSegmentation object,\n * SemanticPartSegmentation object, or an array of PartSegmentation object.\n * @param foreground Default to {r:0, g:0, b:0, a: 0}. The foreground color\n * (r,g,b,a) for visualizing pixels that belong to people.\n * @param background Default to {r:0, g:0, b:0, a: 255}. The background color\n * (r,g,b,a) for visualizing pixels that don't belong to people.\n * @param drawContour Default to false. Whether to draw the contour around each\n * person's segmentation mask or body part mask.\n * @param foregroundIds Default to [1]. The integer values that represent\n * foreground. For person segmentation, 1 is the foreground. For body part\n * segmentation, it can be a subset of all body parts ids.\n * @returns An ImageData with the same width and height of\n * all the PersonSegmentation in multiPersonSegmentation, with opacity and\n * transparency at each pixel determined by the corresponding binary\n * segmentation value at the pixel from the output.\n */\nexport\nfunction toMask(\n  personOrPartSegmentation: SemanticPersonSegmentation|\n  SemanticPartSegmentation|PersonSegmentation[]|PartSegmentation[],\n  foreground: Color = {\n    r: 0,\n    g: 0,\n    b: 0,\n    a: 0\n  },\n  background: Color = {\n    r: 0,\n    g: 0,\n    b: 0,\n    a: 255\n  },\n  drawContour = false, foregroundIds: number[] = [1]): ImageData {\n  if (Array.isArray(personOrPartSegmentation) &&\n    personOrPartSegmentation.length === 0) {\n    return null;\n  }\n  let multiPersonOrPartSegmentation:\n    Array<SemanticPersonSegmentation|SemanticPartSegmentation|\n    PersonSegmentation|PartSegmentation>;\n  if (!Array.isArray(personOrPartSegmentation)) {\n    multiPersonOrPartSegmentation = [personOrPartSegmentation];\n  } else {\n    multiPersonOrPartSegmentation = personOrPartSegmentation;\n  }\n  const {width, height} = multiPersonOrPartSegmentation[0];\n  const bytes = new Uint8ClampedArray(width * height * 4);\n  function drawStroke(\n    bytes: Uint8ClampedArray, row: number, column: number, width: number,\n    radius: number, color: Color = {r: 0, g: 255, b: 255, a: 255}) {\n    for (let i = -radius; i <= radius; i++) {\n      for (let j = -radius; j <= radius; j++) {\n        if (i !== 0 && j !== 0) {\n          const n = (row + i) * width + (column + j);\n          bytes[4 * n + 0] = color.r;\n          bytes[4 * n + 1] = color.g;\n          bytes[4 * n + 2] = color.b;\n          bytes[4 * n + 3] = color.a;\n        }\n      }\n    }\n  }\n  function\n  isSegmentationBoundary(\n    segmentationData: Uint8Array|Int32Array,\n    row: number,\n    column: number,\n    width: number,\n    foregroundIds: number[] = [1],\n    radius = 1,\n  ): boolean {\n    let\n    numberBackgroundPixels = 0;\n    for (let i = -radius; i <= radius; i++) {\n      for (let j = -radius; j <= radius; j++) {\n        if (i !== 0 && j !== 0) {\n          const n = (row + i) * width + (column + j);\n          if\n          (!foregroundIds.some(id => id === segmentationData[n])) {\n            numberBackgroundPixels += 1;\n          }\n        }\n      }\n    }\n    return numberBackgroundPixels > 0;\n  }\n  for (let i = 0; i < height; i += 1) {\n    for (let j = 0; j < width; j += 1) {\n      const n = i * width + j;\n      bytes[4 * n + 0] = background.r;\n      bytes[4 * n + 1] = background.g;\n      bytes[4 * n + 2] = background.b;\n      bytes[4 * n + 3] = background.a;\n      for (let k = 0; k < multiPersonOrPartSegmentation.length; k++) {\n        if (foregroundIds.some(\n          id => id === multiPersonOrPartSegmentation[k].data[n])) {\n          bytes[4 * n] = foreground.r;\n          bytes[4 * n + 1] = foreground.g;\n          bytes[4 * n + 2] = foreground.b;\n          bytes[4 * n + 3] = foreground.a;\n          const

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isBoundary = isSegmentationBoundary(\n          multiPersonOrPartSegmentation[k].data, i, j, width,\n foregroundIds);\n      if (drawContour && i - 1 >= 0 && i + 1 < height && j - 1 >= 0 &&\n          j + 1 < width && isBoundary) {\n          drawStroke(bytes, i, j, width, 1);\n          }\n          }\n          }\n          }\n\n return new\n ImageData(bytes, width, height);\n}\n\nconst RAINBOW_PART_COLORS: Array<[number, number, number]> =\n[\n [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255, 94, 99],\n [255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n [175, 240, 91], [135, 245, 87],\n [96, 247, 96], [64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195]];\n}\n\n/**\n * Given the output from person body part segmentation (or\n multi-person\n * instance body part segmentation) and an array of colors indexed by part id,\n * generates an image\n with the corresponding color for each part at each pixel,\n * and white pixels where there is no part.\n *\n * @param\n partSegmentation The output from segmentPersonParts\n * or segmentMultiPersonParts. The former is a\n SemanticPartSegmentation\n * object and later is an array of PartSegmentation object.\n *\n * @param\n partColors A\n multi-dimensional array of rgb colors indexed by\n * part id. Must have 24 colors, one for every part.\n *\n *\n * @returns\n An ImageData with the same width and height of all the element in\n * multiPersonPartSegmentation,\n with the corresponding color for each part at\n * each pixel, and black pixels where there is no part.\n */\n\nexport\n function toColoredPartMask(\n partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n partColors:\n Array<[number, number, number]> =\n RAINBOW_PART_COLORS): ImageData {\n if\n (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n return null;\n }\n\n let\n multiPersonPartSegmentation;\n if (!Array.isArray(partSegmentation)) {\n multiPersonPartSegmentation =\n [partSegmentation];\n } else {\n multiPersonPartSegmentation = partSegmentation;\n }\n\n const {width, height}\n = multiPersonPartSegmentation[0];\n const bytes = new Uint8ClampedArray(width * height * 4);\n\n for (let i = 0;\n i < height * width; ++i) {\n // invert mask. Invert the segmentation mask.\n const j = i * 4;\n bytes[j + 0] =\n 255;\n bytes[j + 1] = 255;\n bytes[j + 2] = 255;\n bytes[j + 3] = 255;\n\n for (let k = 0; k <\n multiPersonPartSegmentation.length; k++) {\n const partId = multiPersonPartSegmentation[k].data[i];\n if\n (partId !== -1) {\n const color = partColors[partId];\n if (!color) {\n throw new Error('No color could\n be found for part id ${partId}');\n }\n bytes[j + 0] = color[0];\n bytes[j + 1] = color[1];\n bytes[j +\n 2] = color[2];\n bytes[j + 3] = 255;\n }\n }\n }\n\n return new ImageData(bytes, width, height);\n}\n\nconst\n CANVAS_NAMES = {\n blurred: 'blurred',\n blurredMask: 'blurred-mask',\n mask: 'mask',\n lowresPartMask:\n 'lowres-part-mask',\n};\n\n/**\n * Given an image and a maskImage of type ImageData, draws the image with the\n *\n * mask on top of it onto a canvas.\n *\n * @param\n canvas The canvas to be drawn onto.\n *\n * @param\n image The\n original image to apply the mask to.\n *\n * @param\n maskImage An ImageData containing the mask. Ideally this\n should be\n * generated by toMask or toColoredPartMask.\n *\n * @param\n maskOpacity The opacity of the mask\n when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param\n maskBlurAmount How many pixels to blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n *\n * @param\n flipHorizontal If the result should be flipped horizontally. Defaults\n * to false.\n */\n\nexport\n function\n drawMask(\n canvas: Canvas, image: ImageType, maskImage: ImageData|null,\n maskOpacity = 0.7,\n maskBlurAmount = 0, flipHorizontal = false) {\n const [height, width] = getInputSize(image);\n canvas.width =\n width;\n canvas.height = height;\n\n const ctx = canvas.getContext('2d');\n ctx.save();\n if (flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n\n ctx.drawImage(image, 0, 0);\n ctx.globalAlpha = maskOpacity;\n if\n (maskImage) {\n assertSameDimensions({width, height}, maskImage, 'image', 'mask');\n\n const mask =\n renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n\n const blurredMask =\n drawAndBlurImageOnOffScreenCanvas(\n mask, maskBlurAmount, CANVAS_NAMES.blurredMask);\n\n ctx.drawImage(blurredMask, 0, 0, width, height);\n }\n\n ctx.restore();\n}\n\n/**\n * Given an image and a\n maskImage of type ImageData, draws the image with the\n * pixelated mask on top of it onto a canvas.\n *\n * @param\n canvas to be drawn onto.\n *\n * @param\n image The original image to apply the mask to.\n *\n * @param\n maskImage An ImageData containing the mask. Ideally this should be\n * generated by\n toColoredPartMask.\n *\n * @param\n maskOpacity The opacity of the mask when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param\n maskBlurAmount How many pixels to

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blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the
result should be flipped horizontally. Defaults\n * to false.\n *\n * @param pixelCellWidth The width of each pixel
cell. Default to 10 px.\n */\nexport function drawPixelatedMask(\n  canvas: Canvas, image: ImageType,
maskImage: ImageData,\n  maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false,\n  pixelCellWidth =
10.0) {\n  const [height, width] = getInputSize(image);\n  assertSameDimensions({ width, height }, maskImage,
'image', 'mask');\n\n  const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n  const blurredMask = drawAndBlurImageOnOffScreenCanvas(\n    mask, maskBlurAmount,
CANVAS_NAMES.blurredMask);\n\n  canvas.width = blurredMask.width;\n  canvas.height =
blurredMask.height;\n\n  const ctx = canvas.getContext('2d');\n  ctx.save();\n  if (flipHorizontal) {\n    flipCanvasHorizontal(canvas);\n  }\n\n  const offscreenCanvas =\n  ensureOffscreenCanvasCreated(CANVAS_NAMES.lowresPartMask);\n  const offscreenCanvasCtx =
offscreenCanvas.getContext('2d');\n  offscreenCanvas.width = blurredMask.width * (1.0 / pixelCellWidth);\n  offscreenCanvas.height = blurredMask.height * (1.0 / pixelCellWidth);\n  offscreenCanvasCtx.drawImage(\n    blurredMask, 0, 0, blurredMask.width, blurredMask.height, 0, 0,\n    offscreenCanvas.width,
offscreenCanvas.height);\n  ctx.imageSmoothingEnabled = false;\n  ctx.drawImage(\n    offscreenCanvas, 0, 0,
offscreenCanvas.width, offscreenCanvas.height, 0,\n    0, canvas.width, canvas.height);\n\n  // Draws vertical grid
lines that are `pixelCellWidth` apart from each other.\n  for (let i = 0; i < offscreenCanvas.width; i++) {\n    ctx.beginPath();\n    ctx.strokeStyle = '#ffffff';\n    ctx.moveTo(pixelCellWidth * i, 0);\n    ctx.lineTo(pixelCellWidth
* i, canvas.height);\n    ctx.stroke();\n  }\n\n  // Draws horizontal grid lines that are `pixelCellWidth` apart from
each\n  // other.\n  for (let i = 0; i < offscreenCanvas.height; i++) {\n    ctx.beginPath();\n    ctx.strokeStyle =
'#ffffff';\n    ctx.moveTo(0, pixelCellWidth * i);\n    ctx.lineTo(canvas.width, pixelCellWidth * i);\n    ctx.stroke();\n  }\n\n  ctx.globalAlpha = 1.0 - maskOpacity;\n  ctx.drawImage(image, 0, 0, blurredMask.width,
blurredMask.height);\n  ctx.restore();\n}\n\nfunction createPersonMask(\n  multiPersonSegmentation:
PersonSegmentation[]|SemanticPersonSegmentation,\n  edgeBlurAmount: number): Canvas {\n  const
backgroundMaskImage = toMask(\n    multiPersonSegmentation, {r: 0, g: 0, b: 0, a: 255},\n    {r: 0, g: 0, b: 0, a:
0});\n\n  const backgroundMask =\n    renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n  if (edgeBlurAmount === 0) {\n    return backgroundMask;\n  } else {\n    return
drawAndBlurImageOnOffScreenCanvas(\n    backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n  }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred
image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param
personSegmentation A SemanticPersonSegmentation or an array of\n * PersonSegmentation object.\n *\n * @param
backgroundBlurAmount How many pixels in the background blend into each\n * other. Defaults to 3. Should be an
integer between 1 and 20.\n *\n * @param edgeBlurAmount How many pixels to blur on the edge between the
person\n * and the background by. Defaults to 3. Should be an integer between 0 and 20.\n *\n * @param
flipHorizontal If the output should be flipped horizontally. Defaults\n * to false.\n */\nexport function
drawBokehEffect(\n  canvas: Canvas, image: ImageType,\n  multiPersonSegmentation:
SemanticPersonSegmentation|PersonSegmentation[],\n  backgroundBlurAmount = 3, edgeBlurAmount = 3,
flipHorizontal = false) {\n  const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n    image,
backgroundBlurAmount, CANVAS_NAMES.blurred);\n  canvas.width = blurredImage.width;\n  canvas.height =
blurredImage.height;\n\n  const ctx = canvas.getContext('2d');\n\n  if (Array.isArray(multiPersonSegmentation)
&&\n    multiPersonSegmentation.length === 0) {\n    ctx.drawImage(blurredImage, 0, 0);\n    return;\n  }\n\n  const personMask = createPersonMask(multiPersonSegmentation, edgeBlurAmount);\n\n  ctx.save();\n  if
(flipHorizontal) {\n    flipCanvasHorizontal(canvas);\n  }\n  // draw the original image on the final canvas\n  const
[height, width] = getInputSize(image);\n  ctx.drawImage(image, 0, 0, width, height);\n\n  // \"destination-in\" - \"The
existing canvas content is kept where both the\n  // new shape and existing canvas content overlap. Everything else
is made\n  // transparent.\"\n  // crop what's not the person using the mask from the original image\n  drawWithCompositing(ctx, personMask, 'destination-in');\n  // \"destination-over\" - \"The existing canvas content is

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kept where both the
transparent.
drawWithCompositing(ctx, blurredImage, 'destination-over');
ctx.restore();
}
function
createBodyPartMask(
  multiPersonPartSegmentation: SemanticPartSegmentation|PartSegmentation[],
  bodyPartIdsToMask: number[], edgeBlurAmount: number): Canvas {
  const backgroundMaskImage = toMask(
    multiPersonPartSegmentation, {r: 0, g: 0, b: 0, a: 0},
    {r: 0, g: 0, b: 0, a: 255}, true, bodyPartIdsToMask);
  const backgroundMask =
    renderImageDataToOffScreenCanvas(backgroundMaskImage,
    CANVAS_NAMES.mask);
  if (edgeBlurAmount === 0) {
    return backgroundMask;
  } else {
    return
    drawAndBlurImageOnOffScreenCanvas(
      backgroundMask, edgeBlurAmount,
      CANVAS_NAMES.blurredMask);
  }
}
/**
 * Given a personSegmentation and an image, draws the image
 * with its background
 * blurred onto the canvas.
 * @param canvas The canvas to draw the background-blurred
 * image onto.
 * @param image The image to blur the background of and draw.
 * @param
 * partSegmentation A SemanticPartSegmentation or an array of
 * PartSegmentation object.
 * @param
 * bodyPartIdsToBlur Default to [0, 1] (left-face and right-face). An
 * array of body part ids to blur. Each must be
 * one of the 24 body part ids.
 * @param backgroundBlurAmount How many pixels in the background blend into
 * each
 * other. Defaults to 3. Should be an integer between 1 and 20.
 * @param edgeBlurAmount How many
 * pixels to blur on the edge between the person
 * and the background by. Defaults to 3. Should be an integer
 * between 0 and 20.
 * @param flipHorizontal If the output should be flipped horizontally. Defaults
 * to
 * false.
 */
export function blurBodyPart(
  canvas: Canvas, image: ImageType,
  partSegmentation:
  SemanticPartSegmentation|PartSegmentation[],
  bodyPartIdsToBlur = [0, 1], backgroundBlurAmount = 3,
  edgeBlurAmount = 3,
  flipHorizontal = false) {
  const blurredImage =
  drawAndBlurImageOnOffScreenCanvas(
    image, backgroundBlurAmount, CANVAS_NAMES.blurred);
  canvas.width = blurredImage.width;
  canvas.height = blurredImage.height;
  const ctx =
  canvas.getContext('2d');
  if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {
    ctx.drawImage(blurredImage, 0, 0);
    return;
  }
  const bodyPartMask =
  createBodyPartMask(partSegmentation, bodyPartIdsToBlur, edgeBlurAmount);
  ctx.save();
  if (flipHorizontal)
  {
    flipCanvasHorizontal(canvas);
  }
  // draw the original image on the final canvas
  const [height, width] =
  getInputSize(image);
  ctx.drawImage(image, 0, 0, width, height);
  // "destination-in" - "The existing canvas
  content is kept where both the
  // new shape and existing canvas content overlap. Everything else is made
  //
  transparent."
  // crop what's not the person using the mask from the original image
  drawWithCompositing(ctx,
  bodyPartMask, 'destination-in');
  // "destination-over" - "The existing canvas content is kept where both the
  //
  new shape and existing canvas content overlap. Everything else is made
  // transparent."
  // draw the blurred
  background on top of the original image where it doesn't
  // overlap.
  drawWithCompositing(ctx, blurredImage,
  'destination-over');
  ctx.restore();
}
/**
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 * Copyright 2020 Google Inc. All Rights Reserved.
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 * compliance with the License.
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 * WITHOUT WARRANTIES
 * OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language
 * governing permissions and
 * limitations under the License.
 */
=====
*/
export const PART_CHANNELS: string[] = [
  'left_face',
  'right_face',
  'left_upper_arm_front',
  'left_upper_arm_back',
  'right_upper_arm_front',
  'right_upper_arm_back',
  'left_lower_arm_front',
  'left_lower_arm_back',
  'right_lower_arm_front',
  'right_lower_arm_back',
  'left_hand',
  'right_hand',
  'torso_front',
  'torso_back',
  'left_upper_leg_front',
  'left_upper_leg_back',
  'right_upper_leg_front',
  'right_upper_leg_back',
  'left_lower_leg_front',
  'left_lower_leg_back',
  'right_lower_leg_front',
  'right_lower_leg_back',
  'left_feet',
  'right_feet'];
/**
 * @license See the LICENSE file.
 */
// This code is
auto-generated, do not modify this file!
export {version};
/**
 * @license

```

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"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nexport {BodyPix, load} from './body_pix_model';\nexport {blurBodyPart, drawBokehEffect, drawMask,  
drawPixelatedMask, toColoredPartMask, toMask} from './output_rendering_util';\nexport {PART_CHANNELS}  
from './part_channels';\nexport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation,  
SemanticPersonSegmentation} from './types';\nexport {flipPoseHorizontal, resizeAndPadTo,  
scaleAndCropToInputTensorShape} from './util';\nexport {version} from  
 './version';\n\n], "names": ["tf.argmax", "tf.reshape", "tf.oneHot", "tf.mul", "tf.tidy", "tf.cast", "tf.greater", "tf.scalar", "tf.ex  
pandDims", "tf.range", "tf.matmul", "tf.add", "tf.sub", "tf.util", "tf.squeeze", "tf.sigmoid", "tf.div", "tf.tensor", "tf.backend"  
 , "tf.equal", "getBackend", "tf.engine", "tf.Tensor", "tf.browser", "tf.image", "tf.reverse", "tf.pad3d", "tfconv.loadGraphM  
odel"], "mappings": ";;;;;;;;;;;;;IAAA;;;;;;;;;;;;;AAiBA,I  
AEA;;;;;;;;;IAMA,SAAS,wBAAwB,CAAC,iBAA8B;QAC9D,IAAM,QAAQ,GAAG,iBAAiB,CAAC,KAAK,CAAC,  
CAAC,CAAC,CAAC;QAC5C,IAAM,gBAAgB,GAAGA,SAAS,CAAC,iBAAiB,EAAE,CAAC,CAAC,CAAC;QA  
EzD,IAAM,gBAAgB,GAAGC,UAAU,CAAC,gBAAgB,EAAE,CAAC,CAAC,CAAC,CAAC,CAAC;QAE5  
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AkB,EAAE,IAAiB;QACzD,OAAOC,MAAM,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC;IAC7B,CAAC;IAED;;;;;;;;  
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Found in path(s):

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No license file was found, but licenses were detected in source scan.

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AUR,SA AU,EA AS,GAGhB,IADP,EAAO,EA AK,OA CL,EA AK,SAFM,MAGhB,EAAO,EA AK,MAAM,EA AG,E
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AJ,IACN,GA AK,QA CL,IA AM,EA KD,OA HP,IA AK,UACL,GA AK,YAKD,EA Ae,IA AI,YA AY,MA ErC,EA Aa,G
AAK,EACb,IA AA,IA AI,EA AI,EA AG,EA AI,KAAM,IACxB,EA Aa,GA AK,EA AgB,GA E/B,IA AA,IA AI,EA AI,K
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EA AW,eAAe,GAC hD,EA Ac,UAA Y,KA AM,KAC hC,EA Ac,QAAU,CAAA,GA AS,EAAO,MA I5C,SA AS,IACH,K
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W,GAC7D,IAAA,GA AK,EA AgB,EAAA,iBAAA,EA AG,IA AK,OAC hB,SAAb,EA AG,QA CL,GA AK,EA AK,EA A
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BA,SAAS,EA A8B,EA AsB,GAAO,GAC5D,MAAA,GAAU,EA AgB,EAAA,iBAAA,EA AQ,SA AU,cAK9C,IAHU,I
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B,KAgC/C,OAJBU,EA AW,EAAA,YAAA,CA AC,EA AgB,KACrC,MACA,GAAO,EA AI,EAAA,KAAA,EA AQ,G
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GAC9C,IA AA,IA AI,EA AI,EA AG,EA AI,EA AK,SA AU,EAC7B,GAAA,EA AK,EA AK,OA AS,EA AI,KAAO,EA A
O,EA AI,EAC pC,OAAA,EAGJ,OAAA,EAGH,SA AU,EACZ,EA AqB,EA AqB,GACtC,MAAA,EA AO,EA AU,OA A
S,EA AU,OAC pC,EA AM,GACR,IA AA,EA AS,EACT,EA AY,EACT,IA AA,IA AI,EA AM,EA AG,EA AM,EA AM,K
ACH,IA AvB,EA AK,QAAQ,GACf,EA AI,KAAK,EA AU,MA EnB,EA AI,KAAK,EA AU,MAGhB,OAAA,EAGH,S
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M,KACD,IA AvB,EA AK,QAAQ,IACf,EA AS,KAAK,EA AO,IA IB,MAAA,CA AC,EADY,EA AK,IA AI,GAAO,EA
AO,KAIvC,SA AU,EACZ,EA AiB,GA EZ,OAAA,EA AiB,EADD,EA AK,IA AI,GA AK,GACU,GAG3C,SA AU,EAC
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G,EA AI,IA AQ,GACD,IA ArB,EA AK,QAAQ,IACf,EA AO,KAAK,GA IT,OADP,EA AK,QAAQ,GAAQ,EA AO,KA
AK,IAC1B,EA IH,SA AU,EA AuB,GAC9B,OAAA,EA AK,IA AI,CA AC,EA AM,IA AM,CA AC,EA AG,IAC5B,KAA
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AS,EA CL,EA AsB,EA AwB,KAAM,GA AW,GAC3D,MAAA,GA AK,EA AgB,EAAA,iBAAA,EA AG,IA AK,aAE7B
,GAAO,EA Ae,EAAA,gBAAA,EA AM,EA AG,OAC/B,GAAO,EA AI,EAAA,KAAA,EA AI,GA AM,GACrB,GA AI,
EA AI,EAAA,KAAA,EA AI,GACZ,GA AI,EA AI,EAAA,KAAA,GACR,GA AI,EA AI,EAAA,KAAA,EA AG,GACX,
GA AI,EA AI,EAAA,KAAA,GACR,GA AM,EA AI,EAAA,MAAA,EA AQ,EAAA,SAAA,EA AM,EA AE,OA AQ,GA
EpC,GAAA,EA AU,CACN,MAAA,GA AW,EA AqB,EAAA,sBAAA,EA AI,MA AO,GAC1C,OAAA,EA AQ,EAAA,
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D+B,UAE3C,YAAa,QACb,WAA Y,GAHP,QAAA,gBAAA;;ACFA,aAAA,OAAA,eAAA,QAAA,aAAA,CAAA,O
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```

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\n
*/\n\nimport {Backend, DataId} from './tensor';\nimport {BackendValues, DataType} from './types';\n\nexport
const EPSILON_FLOAT32 = 1e-7;\nexport const EPSILON_FLOAT16 = 1e-4;\n\n// Required information for all
backends.\nexport interface BackendTimingInfo {\n  kernelMs: number;{error: string};\n  getExtraProfileInfo?():
string; // a field for additional timing information\n\n  // e.g. packing / unpacking for WebGL
backend\n}\n\nexport interface TensorStorage {\n  read(dataId: DataId): Promise<BackendValues>;\n  readSync(dataId: DataId): BackendValues;\n  disposeData(dataId: DataId, force?: boolean): boolean;\n  write(values: BackendValues, shape: number[], dtype: DataType): DataId;\n  move(\n    dataId: DataId, values:
BackendValues, shape: number[], dtype: DataType,\n    refCount: number): void;\n  memory(): {unreliable:
boolean}; // Backend-specific information.\n\n  /** Returns number of data ids currently in the storage. */\n  numDataIds(): number;\n  refCount(dataId: DataId): number;\n}\n\n/** Convenient class for storing tensor-related
data. */\nexport class DataStorage<T> {\n  private data = new WeakMap<DataId, T>();\n  private dataIdsCount =
0;\n\n  constructor(private backend: KernelBackend, private dataMover: DataMover) {\n\n    get(dataId: DataId) {\n
if (!this.data.has(dataId)) {\n      this.dataMover.moveData(this.backend, dataId);\n    }\n    return

```

```

this.data.get(dataId);\n }\n\n set(dataId: DataId, value: T): void {\n  this.dataIdsCount++;\n  this.data.set(dataId,\n  value);\n }\n\n has(dataId: DataId): boolean {\n  return this.data.has(dataId);\n }\n\n delete(dataId: DataId):\n  boolean {\n  this.dataIdsCount--;\n  return this.data.delete(dataId);\n }\n\n numDataIds(): number {\n  return\n  this.dataIdsCount;\n }\n}\n\nexport interface DataMover {\n  /**\n   * To be called by backends whenever they see\n   a dataId that they don't own.\n   * Upon calling this method, the mover will fetch the tensor from another\n   * backend and register it with the current active backend.\n   */\n  moveData(backend: KernelBackend, dataId:\n  DataId): void;\n}\n\nexport interface BackendTimer {\n  // check if backend timer is available\n  timerAvailable():\n  boolean;\n  time(f: () => void): Promise<BackendTimingInfo>;\n}\n\n/**\n * The interface that defines the kernels\n that should be implemented when\n * adding a new backend. New backends don't need to implement every one of\n the\n * methods, this can be done gradually (throw an error for unimplemented\n * methods).\n */\nexport class\n  KernelBackend implements TensorStorage, Backend, BackendTimer {\n  refCount(dataId: DataId): number {\n  return notYetImplemented('refCount');\n }\n  incRef(dataId: DataId): void {\n  return\n  notYetImplemented('incRef');\n }\n  timerAvailable(): boolean {\n  return true;\n }\n  time(f: () => void):\n  Promise<BackendTimingInfo> {\n  return notYetImplemented('time');\n }\n  read(dataId: object):\n  Promise<BackendValues> {\n  return notYetImplemented('read');\n }\n  readSync(dataId: object): BackendValues\n  {\n  return notYetImplemented('readSync');\n }\n  numDataIds(): number {\n  return\n  notYetImplemented('numDataIds');\n }\n  disposeData(dataId: object, force?: boolean): boolean {\n  return\n  notYetImplemented('disposeData');\n }\n  write(values: BackendValues, shape: number[], dtype: DataType): DataId\n  {\n  return notYetImplemented('write');\n }\n  move(\n    dataId: DataId, values: BackendValues, shape:\n    number[], dtype: DataType,\n    refCount: number): void {\n  return notYetImplemented('move');\n }\n  memory(): {unreliable: boolean; reasons?: string[]} {\n  return notYetImplemented('memory');\n }\n  /** Returns\n  the highest precision for floats in bits (e.g. 16 or 32) */\n  floatPrecision(): 16|32 {\n  return\n  notYetImplemented('floatPrecision');\n }\n  /** Returns the smallest representable number. */\n  epsilon(): number\n  {\n  return this.floatPrecision() === 32 ? EPSILON_FLOAT32 : EPSILON_FLOAT16;\n }\n  dispose(): void {\n  return notYetImplemented('dispose');\n }\n}\n\nfunction notYetImplemented(kernelName: string): never {\n  throw\n  new Error(\n    `_${kernelName}_ not yet implemented or not found in the registry. ` +\n    ` This kernel may not be\n    supported by the tfjs backend you have chosen`);\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n  Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n * *n *\n  http://www.apache.org/licenses/LICENSE-2.0\n * *n *\n  Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n * *n *\n  =====\n */\nimport {DataType, DataTypeMap, FlatVector, NumericDataType, RecursiveArray, TensorLike, TypedArray}\nfrom './types';\n\n/**\n * Shuffles the array in-place using Fisher-Yates algorithm.\n */\nconst a = [1, 2, 3,\n  4, 5];\n * tf.util.shuffle(a);\n * console.log(a);\n */\n * @param array The array to shuffle in-place.\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function shuffle(array:\n  any[]|Uint32Array|Int32Array|Float32Array): void {\n  let counter = array.length;\n  let temp = 0;\n  let index = 0;\n  // While there are elements in the array\n  while (counter > 0) {\n    // Pick a random index\n    index\n    = (Math.random() * counter) | 0;\n    // Decrease counter by 1\n    counter--;\n    // And swap the last element with\n    it\n    temp = array[counter];\n    array[counter] = array[index];\n    array[index] = temp;\n  }\n}\n\n/**\n * Shuffles\n  two arrays in-place the same way using Fisher-Yates algorithm.\n */\nconst a = [1,2,3,4,5];\n * const b =\n  [11,22,33,44,55];\n * tf.util.shuffleCombo(a, b);\n * console.log(a, b);\n */\n * @param array The first array\n  to shuffle in-place.\n * @param array2 The second array to shuffle in-place with the same permutation\n * as the\n  first array.\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function\n  shuffleCombo(array: any[]|Uint32Array|Int32Array|Float32Array,\n  array2: any[]|Uint32Array|Int32Array|Float32Array): void {\n  if (array.length !== array2.length) {\n    throw

```

```

Error(`Array sizes must match to be shuffled together` + `First array length was ${array.length}` + `Second array length was ${array2.length}`);
} let counter = array.length; let temp, temp2; let index = 0;
// While there are elements in the array
while (counter > 0) {
  // Pick a random index
  index = (Math.random() * counter) | 0;
  // Decrease counter by 1
  counter--;
  // And swap the last element of each array with it
  temp = array[counter]; temp2 = array2[counter]; array[counter] = array[index]; array2[counter] = array2[index]; array[index] = temp; array2[index] = temp2;
}
}

/** Clamps a value to a specified range.
 * @export function clamp(min: number, x: number, max: number): number {
  return Math.max(min, Math.min(x, max));
}

/** nearestLargerEven(val: number): number {
  return val % 2 === 0 ? val : val + 1;
}

/** sum(arr: number[]): number {
  let sum = 0;
  for (let i = 0; i < arr.length; i++) {
    sum += arr[i];
  }
  return sum;
}

/** Returns a sample from a uniform [a, b) distribution.
 * @param a The minimum support (inclusive).
 * @param b The maximum support (exclusive).
 * @return A pseudorandom number on the half-open interval [a,b).
 * @export function randUniform(a: number, b: number) {
  const r = Math.random();
  return (b * r) + (1 - r) * a;
}

/** Returns the squared Euclidean distance between two vectors.
 * @export function distSquared(a: FlatVector, b: FlatVector): number {
  let result = 0;
  for (let i = 0; i < a.length; i++) {
    const diff = Number(a[i]) - Number(b[i]);
    result += diff * diff;
  }
  return result;
}

/** Asserts that the expression is true. Otherwise throws an error with the provided message.
 * @param expr The expression to assert (as a boolean).
 * @param msg A function that returns the message to report when throwing an error. We use a function for performance reasons.
 * @doc {heading: 'Util', namespace: 'util'}
 * @export function assert(expr: boolean, msg: () => string) {
  if (!expr) {
    throw new Error(typeof msg === 'string' ? msg : msg());
  }
}

/** assertShapesMatch(shapeA: number[], shapeB: number[], errorMessagePrefix = "): void {
  assert(arraysEqual(shapeA, shapeB), () => errorMessagePrefix + `Shapes ${shapeA} and ${shapeB} must match`);
}

/** assertNonNull(a: TensorLike): void {
  assert(a != null, () => `The input to the tensor constructor must be a non-null value.`);
}

// NOTE: We explicitly type out what T extends instead of any so that util.flatten on a nested array of number doesn't try to infer T as a number[][], causing us to explicitly type util.flatten<number>().
 * @export function flatten(a: number[][]) {
  const flat = tf.util.flatten(a);
  console.log(flat);
}

/** @param arr The nested array to flatten.
 * @param result The destination array which holds the elements.
 * @param skipTypedArray If true, avoids flattening the typed arrays. Defaults to false.
 * @doc {heading: 'Util', namespace: 'util'}
 * @export function flatten<T extends number|boolean|string|Promise<number>|TypedArray>(arr: T|RecursiveArray<T>, result: T[] = [], skipTypedArray = false): T[] {
  if (result == null) {
    result = [];
  }
  if (Array.isArray(arr) || isTypedArray(arr) && !skipTypedArray) {
    for (let i = 0; i < arr.length; ++i) {
      flatten(arr[i], result, skipTypedArray);
    }
  } else {
    result.push(arr as T);
  }
  return result;
}

/** Returns the size (number of elements) of the tensor given its shape.
 * @export function sizeFromShape(shape: number[]): number {
  const size = tf.util.sizeFromShape(shape);
  console.log(size);
}

/** @doc {heading: 'Util', namespace: 'util'}
 * @export function sizeFromShape(shape: number[]): number {
  if (shape.length === 0) {
    // Scalar.
    return 1;
  }
  let size = shape[0];
  for (let i = 1; i < shape.length; i++) {
    size *= shape[i];
  }
  return size;
}

/** @export function isScalarShape(shape: number[]): boolean {
  return shape.length === 0;
}

/** @export function arraysEqual(n1: FlatVector, n2: FlatVector) {
  if (n1 === n2) {
    return true;
  }
  if (n1 == null || n2 == null) {
    return false;
  }
  if (n1.length !== n2.length) {
    return false;
  }
  for (let i = 0; i < n1.length; i++) {
    if (n1[i] !== n2[i]) {
      return false;
    }
  }
  return true;
}

/** @export function isInt(a: number): boolean {
  return a % 1 === 0;
}

/** @export function tanh(x: number): number {
  // tslint:disable-next-line:no-any
  if ((Math as any).tanh != null) {
    // tslint:disable-next-line:no-any
    return (Math as any).tanh(x);
  }
  if (x === Infinity) {
    return 1;
  }
  if (x === -Infinity) {
    return -1;
  }
  else {
    const e2x = Math.exp(2 * x);
    return (e2x - 1) / (e2x + 1);
  }
}

/** @export function sizeToSquarishShape(size: number): [number, number] {
  const width = Math.ceil(Math.sqrt(size));
  return [width, Math.ceil(size / width)];
}

/** Creates a new array with randomized indicies to a given quantity.
 * @export function randomTen =

```



```

tf.util.createShuffledIndices(10);\n * console.log(randomTen);\n * ```\n *\n * @param number Quantity of how many shuffled indices to create.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n * ^\nexport function createShuffledIndices(n: number): Uint32Array {\n  const shuffledIndices = new Uint32Array(n);\n  for (let i = 0; i < n; ++i) {\n    shuffledIndices[i] = i;\n  }\n  shuffle(shuffledIndices);\n  return shuffledIndices;\n}\n\nexport function rightPad(a: string, size: number): string {\n  if (size <= a.length) {\n    return a;\n  }\n  return a + ' '.repeat(size - a.length);\n}\n\nexport function repeatedTry(\n  checkFn: () => boolean, delayFn = (counter: number) => 0,\n  maxCounter?: number): Promise<void> {\n  return new Promise<void>((resolve, reject) => {\n    let tryCount = 0;\n\n    const tryFn = () => {\n      if (checkFn()) {\n        resolve();\n        return;\n      }\n\n      tryCount++;\n\n      const nextBackoff = delayFn(tryCount);\n      if (maxCounter != null && tryCount >= maxCounter) {\n        reject();\n        return;\n      }\n      setTimeout(tryFn, nextBackoff);\n    }; \n\n    tryFn();\n  });\n}\n\n/**\n * Given the full size of the array and a shape that may contain -1 as the\n * implicit dimension, returns the inferred shape where -1 is replaced.\n * E.g. For shape=[2, -1, 3] and size=24, it will return [2, 4, 3].\n *\n * @param shape The shape, which may contain -1 in some dimension.\n * @param size The full size (number of elements) of the array.\n * @return The inferred shape where -1 is replaced with the inferred size.\n * ^\nexport function inferFromImplicitShape(\n  shape: number[], size: number): number[] {\n  let shapeProd = 1;\n  let implicitIdx = -1;\n  for (let i = 0; i < shape.length; ++i) {\n    if (shape[i] >= 0) {\n      shapeProd *= shape[i];\n    } else if (shape[i] === -1) {\n      if (implicitIdx !== -1) {\n        throw Error(`Shapes can only have 1 implicit size. ` +\n          `Found -1 at dim ${implicitIdx} and dim ${i}`);\n      }\n      implicitIdx = i;\n    } else if (shape[i] < 0) {\n      throw Error(`Shapes can not be < 0. Found ${shape[i]} at dim ${i}`);\n    }\n  }\n  if (implicitIdx === -1) {\n    if (size > 0 && size !== shapeProd) {\n      throw Error(`Size(${size}) must match the product of shape ${shape}`);\n    }\n    return shape;\n  }\n  if (shapeProd === 0) {\n    throw Error(`Cannot infer the missing size in ${shape} when ` +\n      `there are 0 elements`);\n  }\n  if (size % shapeProd !== 0) {\n    throw Error(`The implicit shape can't be a fractional number. ` +\n      `Got ${size} / ${shapeProd}`);\n  }\n  const newShape = shape.slice();\n  newShape[implicitIdx] = size / shapeProd;\n  return newShape;\n}\n\nexport function parseAxisParam(\n  axis: number|number[], shape: number[]): number[] {\n  const rank = shape.length;\n  // Normalize input\n  axis = axis == null ? shape.map((s, i) => i) : [].concat(axis);\n  // Check for valid range\n  assert(\n    axis.every(ax => ax >= -rank && ax < rank),\n    () => `All values in axis param must be in range [-${rank}, ${rank}) but ` +\n      `got axis ${axis}`);\n  // Check for only integers\n  assert(\n    axis.every(ax => isInt(ax)),\n    () => `All values in axis param must be integers but ` +\n      `got axis ${axis}`);\n  // Handle negative axis.\n  return axis.map(a => a < 0 ? rank + a : a);\n}\n\n/** Reduces the shape by removing all dimensions of shape 1. *\nexport function squeezeShape(shape: number[], axis?: number[]):\n  {newShape: number[], keptDims: number[]} {\n  const newShape: number[] = [];\n  const keptDims: number[] = [];\n  const isEmptyArray = axis != null && Array.isArray(axis) && axis.length === 0;\n  const axes = (axis == null || isEmptyArray) ?\n    null : parseAxisParam(axis, shape).sort();\n  let j = 0;\n  for (let i = 0; i < shape.length; ++i) {\n    if (axes != null) {\n      if (axes[j] === i && shape[i] !== 1) {\n        throw new Error(`Can't squeeze axis ${i} since its dim '${shape[i]}' is not 1`);\n      }\n      if ((axes[j] == null || axes[j] > i) && shape[i] === 1) {\n        newShape.push(shape[i]);\n        keptDims.push(i);\n      }\n      if (axes[j] <= i) {\n        j++;\n      }\n    }\n    if (shape[i] !== 1) {\n      newShape.push(shape[i]);\n      keptDims.push(i);\n    }\n  }\n  return {newShape, keptDims};\n}\n\nexport function getTypedArrayFromDType<D extends NumericDataType>(\n  dtype: D, size: number): DataTypeMap[D] {\n  let values = null;\n  if (dtype == null || dtype === 'float32') {\n    values = new Float32Array(size);\n  } else if (dtype === 'int32') {\n    values = new Int32Array(size);\n  } else if (dtype === 'bool') {\n    values = new Uint8Array(size);\n  } else {\n    throw new Error(`Unknown data type ${dtype}`);\n  }\n  return values as DataTypeMap[D];\n}\n\nexport function getArrayFromDType<D extends DataType>(\n  dtype: D, size: number): DataTypeMap[D] {\n  let values = null;\n  if (dtype == null || dtype === 'float32') {\n    values = new Float32Array(size);\n  } else if (dtype === 'int32') {\n    values = new Int32Array(size);\n  } else if (dtype === 'bool') {\n    values = new Uint8Array(size);\n  } else if (dtype === 'string') {\n    values = new Array<'string'>(size);\n  } else {\n    throw new Error(`Unknown data type ${dtype}`);\n  }\n  return values as DataTypeMap[D];\n}\n\nexport function checkConversionForErrors<D extends DataType>(\n  vals:

```

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DataTypeMap[D]|number[], dtype: D): void {\n  for (let i = 0; i < vals.length; i++) {\n    const num = vals[i] as
number;\n    if (isNaN(num) || !isFinite(num)) {\n      throw Error(`A tensor of type ${dtype} being uploaded
contains ${num}.`);\n    }\n  }\n}\n\n/** Returns true if the dtype is valid. */\nexport function isValidDtype(dtype:
DataType): boolean {\n  return dtype === 'bool' || dtype === 'complex64' || dtype === 'float32' ||\n  dtype === 'int32' || dtype === 'string';\n}\n\n/** Returns true if the new type can't encode the old type without loss of\nprecision. */\nexport function hasEncodingLoss(oldType: DataType, newType: DataType): boolean {\n  if
(newType === 'complex64') {\n    return false;\n  }\n  if (newType === 'float32' && oldType !== 'complex64') {\n
return false;\n  }\n  if (newType === 'int32' && oldType !== 'float32' && oldType !== 'complex64') {\n
return false;\n  }\n  if (newType === 'bool' && oldType === 'bool') {\n    return false;\n  }\n  return true;\n}\n\nexport
function isArray(a: {}): a is Float32Array|Int32Array|Uint8Array {\n  return a instanceof Float32Array || a
instanceof Int32Array ||\n  a instanceof Uint8Array;\n}\n\nexport function bytesPerElement(dtype: DataType):
number {\n  if (dtype === 'float32' || dtype === 'int32') {\n    return 4;\n  } else if (dtype === 'complex64') {\n
return 8;\n  } else if (dtype === 'bool') {\n    return 1;\n  } else {\n    throw new Error(`Unknown dtype ${dtype}`);\n
}\n}\n\n/** Returns the approximate number of bytes allocated in the string array - 2 * bytes per character.
Computing the exact bytes for a native string in JS is\n* not possible since it depends on the encoding of the html
page that serves\n* the website. */\nexport function bytesFromStringArray(arr: Uint8Array[]): number {\n  if (arr
=== null) {\n    return 0;\n  }\n  let bytes = 0;\n  arr.forEach(x => bytes += x.length);\n  return bytes;\n}\n\n/**
Returns true if the value is a string. */\nexport function isString(value: {}): value is string {\n  return typeof value
=== 'string' || value instanceof String;\n}\n\nexport function isBoolean(value: {}): boolean {\n  return typeof value
=== 'boolean';\n}\n\nexport function isNumber(value: {}): boolean {\n  return typeof value ===
'number';\n}\n\nexport function inferDtype(values: TensorLike): DataType {\n  if (Array.isArray(values)) {\n
return inferDtype(values[0]);\n  }\n  if (values instanceof Float32Array) {\n    return 'float32';\n  } else if (values
instanceof Int32Array || values instanceof Uint8Array) {\n    return 'int32';\n  } else if (isNumber(values)) {\n
return 'float32';\n  } else if (isString(values)) {\n    return 'string';\n  } else if (isBoolean(values)) {\n    return
'bool';\n  }\n  return 'float32';\n}\n\nexport function isFunction(f: Function) {\n  return !!f && f.constructor && f.call &&
f.apply;\n}\n\nexport function nearestDivisor(size: number, start: number): number {\n  for (let i = start; i < size;
++i) {\n    if (size % i === 0) {\n      return i;\n    }\n  }\n  return size;\n}\n\nexport function computeStrides(shape:
number[]): number[] {\n  const rank = shape.length;\n  if (rank < 2) {\n    return [];\n  }\n  // Last dimension has
implicit stride of 1, thus having D-1 (instead of D)\n  // strides.\n  const strides = new Array(rank - 1);\n  strides[rank
- 2] = shape[rank - 1];\n  for (let i = rank - 3; i >= 0; --i) {\n    strides[i] = strides[i + 1] * shape[i + 1];\n  }\n  return
strides;\n}\n\nfunction createNestedArray(offset: number, shape: number[], a: TypedArray) {\n  const ret = new
Array();\n  if (shape.length === 1) {\n    const d = shape[0];\n    for (let i = 0; i < d; i++) {\n      ret[i] = a[offset +
i];\n    }\n  } else {\n    const d = shape[0];\n    const rest = shape.slice(1);\n    const len = rest.reduce((acc, c) => acc
* c);\n    for (let i = 0; i < d; i++) {\n      ret[i] = createNestedArray(offset + i * len, rest, a);\n    }\n  }\n  return
ret;\n}\n\n// Provide a nested array of TypedArray in given shape.\nexport function toNestedArray(shape: number[],
a: TypedArray) {\n  if (shape.length === 0) {\n    // Scalar type should return a single number.\n    return a[0];\n  }\n  const size = shape.reduce((acc, c) => acc * c);\n  if (size === 0) {\n    // A tensor with shape zero should be turned
into empty list.\n    return [];\n  }\n  if (size !== a.length) {\n    throw new Error(`[${shape}] does not match the
input size ${a.length}.`);\n  }\n  return createNestedArray(0, shape, a);\n}\n\nexport function
makeOnesTypedArray<D extends DataType>(\n  size: number, dtype: D): DataTypeMap[D] {\n  const array =
makeZerosTypedArray(size, dtype);\n  for (let i = 0; i < array.length; i++) {\n    array[i] = 1;\n  }\n  return
array;\n}\n\nexport function makeZerosTypedArray<D extends DataType>(\n  size: number, dtype: D):
DataTypeMap[D] {\n  if (dtype === null || dtype === 'float32' || dtype === 'complex64') {\n    return new
Float32Array(size) as DataTypeMap[D];\n  } else if (dtype === 'int32') {\n    return new Int32Array(size) as
DataTypeMap[D];\n  } else if (dtype === 'bool') {\n    return new Uint8Array(size) as DataTypeMap[D];\n  } else {\n
throw new Error(`Unknown data type ${dtype}`);\n  }\n}\n\n/** Make nested `TypedArray` filled with
zeros.\n* @param shape The shape information for the nested array.\n* @param dtype dtype of the array
element. */\nexport function makeZerosNestedTypedArray<D extends DataType>(\n  shape: number[], dtype: D)

```



```

Promise<FlagValue> {\n  if (flagName in this.flags) {\n    return this.flags[flagName];\n  }\n  this.flags[flagName] = await this.evaluateFlag(flagName);\n  return this.flags[flagName];\n }\n\n get(flagName: string): FlagValue {\n  if (flagName in this.flags) {\n    return this.flags[flagName];\n  }\n  const flagValue = this.evaluateFlag(flagName);\n  if (isPromise(flagValue)) {\n    throw new Error(\n      `Flag ${flagName} cannot be synchronously evaluated. ` +\n      `Please use getAsync() instead.`);\n  }\n  this.flags[flagName] = flagValue as number | boolean;\n  return this.flags[flagName];\n }\n\n getNumber(flagName: string): number {\n  return this.get(flagName) as number;\n }\n\n getBool(flagName: string): boolean {\n  return this.get(flagName) as boolean;\n }\n\n getFlags(): Flags {\n  return this.flags;\n }\n\n // For backwards compatibility.\n get features(): Flags {\n  return this.flags;\n }\n\n set(flagName: string, value: FlagValue): void {\n  if (this.flagRegistry[flagName] == null) {\n    throw new Error(\n      `Cannot set flag ${flagName} as it has not been registered.`);\n  }\n  this.flags[flagName] = value;\n  if (this.flagRegistry[flagName].setHook != null) {\n    this.flagRegistry[flagName].setHook(value);\n  }\n }\n\n private evaluateFlag(flagName: string): FlagValue|Promise<FlagValue> {\n  if (this.flagRegistry[flagName] == null) {\n    throw new Error(\n      `Cannot evaluate flag '${flagName}': no evaluation function found.`);\n  }\n  return this.flagRegistry[flagName].evaluationFn();\n }\n\n setFlags(flags: Flags) {\n  this.flags = Object.assign({}, flags);\n }\n\n reset() {\n  this.flags = {};\n  this.urlFlags = {};\n  this.populateURLFlags();\n }\n\n private populateURLFlags(): void {\n  if (typeof this.global === 'undefined' ||\n    typeof this.global.location === 'undefined' ||\n    typeof this.global.location.search === 'undefined') {\n    return;\n  }\n  const urlParams = getQueryParams(this.global.location.search);\n  if (TENSORFLOWJS_FLAGS_PREFIX in urlParams) {\n    const keyValues = urlParams[TENSORFLOWJS_FLAGS_PREFIX].split(',');\n    keyValues.forEach(keyValue => {\n      const [key, value] = keyValue.split(':') as [string, string];\n      this.urlFlags[key] = parseValue(key, value);\n    });\n  }\n }\n\n\nexport function getQueryParams(queryString: string): {[key: string]: string} {\n  const params = {};\n  queryString.replace(/(?:&)([^\s?&]+)(?:=([^\s&]*))/?/g, (s, ...t) => {\n    decodeParam(params, t[0], t[1]);\n    return t.join('=');\n  });\n  return params;\n }\n\n\nfunction decodeParam(\n  params: {[key: string]: string},\n  name: string,\n  value?: string) {\n  params[decodeURIComponent(name)] = decodeURIComponent(value || '');\n }\n\n\nfunction parseValue(flagName: string, value: string): FlagValue {\n  value = value.toLowerCase();\n  if (value === 'true' || value === 'false') {\n    return value === 'true';\n  } else if (`${+value}` === value) {\n    return +value;\n  }\n  throw new Error(\n    `Could not parse value flag value ${value} for flag ${flagName}.`);\n }\n\n\n/**\n * Returns the current environment (a global singleton).\n *\n * The environment object contains the evaluated feature values as well as the\n * active platform.\n *\n * @doc {heading: 'Environment'}\n *\n\nexport function env() {\n  return ENV;\n }\n\n\nexport let ENV: Environment = null;\n\nexport function setEnvironmentGlobal(environment: Environment) {\n  ENV = environment;\n }\n\n\n", // shim for using process in browser\n\nvar process = module.exports = {};\n\n// cached from whatever global is present so that test runners that stub it\n// don't break things. But we need to wrap it in a try catch in case it is\n// wrapped in strict mode code which doesn't define any globals. It's inside a\n// function because try/catches deoptimize in certain engines.\n\n\nvar cachedSetTimeout;\nvar cachedClearTimeout;\n\nfunction defaultSetTimeout() {\n  throw new Error('setTimeout has not been defined');\n }\n\nfunction defaultClearTimeout () {\n  throw new Error('clearTimeout has not been defined');\n }\n\n(function () {\n  try {\n    if (typeof setTimeout === 'function') {\n      cachedSetTimeout = setTimeout;\n    } else {\n      cachedSetTimeout = defaultSetTimeout;\n    }\n  } catch (e) {\n    cachedSetTimeout = defaultSetTimeout;\n  }\n  try {\n    if (typeof clearTimeout === 'function') {\n      cachedClearTimeout = clearTimeout;\n    } else {\n      cachedClearTimeout = defaultClearTimeout;\n    }\n  } catch (e) {\n    cachedClearTimeout = defaultClearTimeout;\n  }\n })()\n\nfunction runTimeout(fun) {\n  if (cachedSetTimeout === setTimeout) {\n    //normal environments in sane situations\n    return setTimeout(fun, 0);\n  }\n  // if setTimeout wasn't available but was latter defined\n  if ((cachedSetTimeout === defaultSetTimeout ||\n  !cachedSetTimeout) && setTimeout) {\n    cachedSetTimeout = setTimeout;\n    return setTimeout(fun, 0);\n  }\n  try {\n    // when when somebody has screwed with setTimeout but no I.E. maddness\n    return\n    cachedSetTimeout(fun, 0);\n  } catch(e){\n    try {\n      // When we are in I.E. but the script has been evaled so I.E. doesn't trust the global object when called normally\n      return\n      cachedSetTimeout.call(null, fun, 0);\n    }\n  }\n}

```

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} catch(e){
    // same as above but when it's a version of I.E. that must have the global object for 'this',
    hopefully our context correct otherwise it will throw a global error
    return cachedSetTimeout.call(this, fun, 0);
}
}

function runClearTimeout(marker) {
    if (cachedClearTimeout === clearTimeout) {
        //normal environments in sane situations
        return clearTimeout(marker);
    } // if clearTimeout wasn't
    available but was latter defined
    if ((cachedClearTimeout === defaultClearTimeout || !cachedClearTimeout) &&
        clearTimeout) {
        cachedClearTimeout = clearTimeout;
        return clearTimeout(marker);
    } try {
        // when when somebody has screwed with setTimeout but no I.E. maddness
        return
        cachedClearTimeout(marker);
    } catch (e) {
        try {
            // When we are in I.E. but the script has been
            evaled so I.E. doesn't trust the global object when called normally
            return cachedClearTimeout.call(null,
            marker);
        } catch (e) {
            // same as above but when it's a version of I.E. that must have the global object
            for 'this', hopefully our context correct otherwise it will throw a global error.
            // Some versions of I.E. have
            different rules for clearTimeout vs setTimeout
            return cachedClearTimeout.call(this, marker);
        }
    }
}

var queue = [];
var draining = false;
var currentQueue;
var queueIndex = -1;

function cleanUpNextTick() {
    if (!draining || !currentQueue) {
        return;
    }
    draining = false;
    if (currentQueue.length) {
        queue = currentQueue.concat(queue);
    } else {
        queueIndex = -1;
    }
    if (queue.length) {
        drainQueue();
    }
}

function drainQueue() {
    if (draining) {
        return;
    }
    var timeout = runTimeout(cleanUpNextTick);
    draining = true;
    var len = queue.length;
    while(len) {
        currentQueue = queue;
        queue = [];
        while (++queueIndex < len) {
            if (currentQueue) {
                currentQueue[queueIndex].run();
            }
            queueIndex = -1;
            len = queue.length;
        }
        currentQueue = null;
        draining = false;
        runClearTimeout(timeout);
    }
    process.nextTick = function (fun) {
        var args = new Array(arguments.length - 1);
        if (arguments.length > 1) {
            for (var i = 1; i <
            arguments.length; i++) {
                args[i - 1] = arguments[i];
            }
        }
        queue.push(new Item(fun, args));
        if (queue.length === 1 && !draining) {
            runTimeout(drainQueue);
        }
    };
    // v8 likes predictable
    objects
    function Item(fun, array) {
        this.fun = fun;
        this.array = array;
    }
    Item.prototype.run = function () {
        this.fun.apply(null, this.array);
    };
    process.title = 'browser';
    process.browser = true;
    process.env =
    {};
    process.argv = [];
    process.version = ""; // empty string to avoid regexp issues
    process.versions =
    {};
    function noop() {}
    process.on = noop;
    process.addListener = noop;
    process.once = noop;
    process.off =
    noop;
    process.removeListener = noop;
    process.removeAllListeners = noop;
    process.emit =
    noop;
    process.prependListener = noop;
    process.prependOnceListener = noop;
    process.listeners = function
    (name) {
        return []
    };
    process.binding = function (name) {
        throw new Error('process.binding is not
        supported');
    };
    process.cwd = function () {
        return '/'
    };
    process.chdir = function (dir) {
        throw new
        Error('process.chdir is not supported');
    };
    process.umask = function() {
        return 0;
    };
}

/*
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 * limitations under the License.
 */
=====

*/

// Note that the identifier globalNameSpace is scoped to this module, but will
// always resolve to the same
// global object regardless of how the module is
// resolved.
let globalNameSpace:
{[_tfGlobals: Map<string, any>]};

export function getGlobalNameSpace():
{[_tfGlobals: Map<string, any>]} {
    if (globalNameSpace === null) {
        //
        let ns:
any;
        if (typeof (window) !== 'undefined') {
            ns = window;
        } else if (typeof (global) !== 'undefined') {
            ns = global;
        } else if (typeof (process) !== 'undefined') {
            ns = process;
        } else if (typeof (self) !==
        'undefined') {
            ns = self;
        } else {
            throw new Error('Could not find a global object');
        }
        globalNameSpace = ns;
    }
    return globalNameSpace;
}

function
getGlobalMap(): Map<string, any> {
    const ns = getGlobalNameSpace();
    if (ns._tfGlobals === null) {

```

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ns._tfGlobals = new Map();\n } \n return ns._tfGlobals;\n}\n\n/**\n * Returns a globally accessible 'singleton'\n * object.\n * @param key the name of the object\n * @param init a function to initialize to initialize this object\n * the first time it is fetched.\n */\nexport function getGlobal<T>(key: string, init: () => T): T {\n  const\n  globalMap = getGlobalMap();\n  if (globalMap.has(key)) {\n    return globalMap.get(key);\n  } else {\n    const\n    singleton = init();\n    globalMap.set(key, singleton);\n    return globalMap.get(key);\n  }\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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=====\n *\n//\nAllow UpperCamelCase variable names\n// tslint:disable: variable-name\n// Unfortunately just enabling PascalCase\n// per file (tslint:enable:\n// allow-pascal-case) doesn't work.\nimport {NamedTensorInfoMap, TensorInfo} from\n './kernel_registry';\nimport {ExplicitPadding} from './ops/conv_util';\nimport {Activation} from\n './ops/fused_types';\nimport {DataType, PixelData} from './types';\n\nexport const Abs = 'Abs';\nexport type\n AbsInputs = UnaryInputs;\n\nexport const Acos = 'Acos';\nexport type AcosInputs = UnaryInputs;\n\nexport const\n Acosh = 'Acosh';\nexport type AcoshInputs = UnaryInputs;\n\nexport const Add = 'Add';\nexport type AddInputs =\n BinaryInputs;\n\nexport const AddN = 'AddN';\nexport type AddNInputs = TensorInfo[];\n\nexport const All =\n 'All';\nexport type AllInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface AllAttrs {\n  axis:\n  number|number[];\n  keepDims: boolean;\n}\n\nexport const Any = 'Any';\nexport type AnyInputs =\n Pick<NamedTensorInfoMap, 'x'>;\nexport interface AnyAttrs {\n  axis: number|number[];\n  keepDims:\n  boolean;\n}\n\nexport const ArgMax = 'ArgMax';\nexport type ArgMaxInputs = Pick<NamedTensorInfoMap,\n 'x'>;\nexport interface ArgMaxAttrs {\n  axis: number;\n}\n\nexport const ArgMin = 'ArgMin';\nexport type\n ArgMinInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ArgMinAttrs {\n  axis: number;\n}\n\nexport\n const Asin = 'Asin';\nexport type AsinInputs = UnaryInputs;\n\nexport const\n Asinh = 'Asinh';\nexport type\n AsinhInputs = UnaryInputs;\n\nexport const Atan = 'Atan';\nexport type AtanInputs = UnaryInputs;\n\nexport const\n Atanh = 'Atanh';\nexport type AtanhInputs = UnaryInputs;\n\nexport const Atan2 = 'Atan2';\nexport type\n Atan2Inputs = BinaryInputs;\n\nexport const AvgPool = 'AvgPool';\nexport type AvgPoolInputs =\n Pick<NamedTensorInfoMap, 'x'>;\nexport interface AvgPoolAttrs {\n  filterSize: [number, number]|number;\n  strides: [number, number]|number;\n  pad: 'valid'|'same'|number;\n  dimRoundingMode?:\n  'floor'|'round'|'ceil';\n}\n\nexport const AvgPoolGrad = 'AvgPoolGrad';\nexport type AvgPoolGradInputs =\n Pick<NamedTensorInfoMap, 'dy'|'input'>;\nexport interface AvgPoolGradAttrs {\n  filterSize: [number,\n number]|number;\n  strides: [number, number]|number;\n  pad: 'valid'|'same'|number;\n}\n\nexport const AvgPool3D =\n 'AvgPool3D';\nexport type AvgPool3DInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface\n AvgPool3DAttrs {\n  filterSize: [number, number, number]|number;\n  strides: [number, number,\n number]|number;\n  pad: 'valid'|'same'|number;\n  dimRoundingMode?: 'floor'|'round'|'ceil';\n  dataFormat:\n  'NDHWC'|'NCDHW';\n}\n\nexport const AvgPool3DGrad = 'AvgPool3DGrad';\nexport type\n AvgPool3DGradInputs = Pick<NamedTensorInfoMap, 'dy'|'input'>;\nexport interface AvgPool3DGradAttrs {\n  filterSize: [number, number, number]|number;\n  strides: [number, number, number]|number;\n  pad:\n  'valid'|'same'|number;\n  dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const BatchMatMul =\n 'BatchMatMul';\nexport type BatchMatMulInputs = Pick<NamedTensorInfoMap, 'a'|'b'>;\nexport interface\n BatchMatMulAttrs {\n  transposeA: boolean;\n  transposeB: boolean;\n}\n\nexport const BatchToSpaceND =\n 'BatchToSpaceND';\nexport type BatchToSpaceNDInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface\n BatchToSpaceNDAAttrs {\n  blockShape: number[];\n  crops: number[][];\n}\n\nexport type BinaryInputs =\n Pick<NamedTensorInfoMap, 'a'|'b'>;\nexport const Bincount = 'Bincount';\nexport type BincountInputs =\n Pick<NamedTensorInfoMap, 'x'|'weights'>;\nexport interface BincountAttrs {\n  size: number;\n}\n\nexport const\n BroadcastTo = 'BroadcastTo';\nexport type BroadcastToInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport

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interface BroadCastToAttrs {\n shape: number[];\n inputShape: number[]; // for gradient\n}\n\n\nexport const Cast =
'Cast';\nexport type CastInputs = UnaryInputs;\nexport interface CastAttrs {\n dtype: DataType;\n}\n\n\nexport const Ceil = 'Ceil';\nexport type CeilInputs = UnaryInputs;\n\n\nexport const ClipByValue = 'ClipByValue';\nexport type
ClipByValueInputs = UnaryInputs;\nexport interface ClipByValueAttrs {\n clipValueMin: number;\n
clipValueMax: number;\n}\n\n\nexport const Complex = 'Complex';\nexport type ComplexInputs =
Pick<NamedTensorInfoMap, 'real'|'imag'>;\n\n\nexport const ComplexAbs = 'ComplexAbs';\nexport type
ComplexAbsInputs = UnaryInputs;\n\n\nexport const Concat = 'Concat';\nexport type ConcatInputs =
TensorInfo[];\nexport interface ConcatAttrs {\n axis: number;\n}\n\n\nexport const Conv2D = 'Conv2D';\nexport type
Conv2DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface Conv2DAttrs {\n strides: [number,
number]|number;\n pad: 'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dilations:
[number, number]|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\n\nexport const Conv2DBackpropFilter =
'Conv2DBackpropFilter';\nexport type Conv2DBackpropFilterInputs = Pick<NamedTensorInfoMap,
'x'|'dy'>;\nexport interface Conv2DBackpropFilterAttrs {\n strides: [number, number]|number;\n pad:
'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dimRoundingMode?:
'floor'|'round'|'ceil';\n filterShape: [number, number, number, number];\n}\n\n\nexport const Conv2DBackpropInput =
'Conv2DBackpropInput';\nexport type Conv2DBackpropInputInputs = Pick<NamedTensorInfoMap,
'dy'|'filter'>;\nexport interface Conv2DBackpropInputAttrs {\n strides: [number, number]|number;\n pad:
'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dimRoundingMode?:
'floor'|'round'|'ceil';\n inputShape: [number, number, number, number];\n}\n\n\nexport const Conv3D =
'Conv3D';\nexport type Conv3DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface Conv3DAttrs
{\n strides: [number, number, number]|number;\n pad: 'valid'|'same';\n dataFormat: 'NDHWC'|'NCDHW';\n
dilations: [number, number, number]|number;\n}\n\n\nexport const Conv3DBackpropFilterV2 =
'Conv3DBackpropFilterV2';\nexport type Conv3DBackpropFilterV2Inputs = Pick<NamedTensorInfoMap,
'x'|'dy'>;\n\n\nexport interface Conv3DBackpropFilterV2Attrs {\n strides: [number, number, number]|number;\n pad:
'valid'|'same';\n filterShape: [number, number, number, number, number];\n}\n\n\nexport const
Conv3DBackpropInputV2 = 'Conv3DBackpropInputV2';\nexport type Conv3DBackpropInputV2Inputs =\n
Pick<NamedTensorInfoMap, 'dy'|'filter'>;\nexport interface Conv3DBackpropInputV2Attrs {\n strides: [number,
number, number]|number;\n pad: 'valid'|'same';\n inputShape: [number, number, number, number,
number];\n}\n\n\nexport const Cos = 'Cos';\nexport type CosInputs = UnaryInputs;\n\n\nexport const Cosh =
'Cosh';\nexport type CoshInputs = UnaryInputs;\n\n\nexport const Cumsum = 'Cumsum';\nexport type CumsumInputs
= Pick<NamedTensorInfoMap, 'x'>;\nexport interface CumsumAttrs {\n axis: number;\n exclusive: boolean;\n
reverse: boolean;\n}\n\n\nexport const CropAndResize = 'CropAndResize';\nexport type CropAndResizeInputs =\n
Pick<NamedTensorInfoMap, 'image'|'boxes'|'boxInd'>;\nexport interface CropAndResizeAttrs {\n cropSize:
[number, number];\n method: 'bilinear'|'nearest';\n extrapolationValue: number;\n}\n\n\nexport const DenseBincount
= 'DenseBincount';\nexport type DenseBincountInputs = Pick<NamedTensorInfoMap, 'x'|'weights'>;\nexport
interface DenseBincountAttrs {\n size: number;\n binaryOutput?: boolean;\n}\n\n\nexport const DepthToSpace =
'DepthToSpace';\nexport type DepthToSpaceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
DepthToSpaceAttrs {\n blockSize: number;\n dataFormat: 'NHWC'|'NCHW';\n}\n\n\nexport const
DepthwiseConv2dNative = 'DepthwiseConv2dNative';\nexport type DepthwiseConv2dNativeInputs =\n
Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface DepthwiseConv2dNativeAttrs {\n strides: [number,
number]|number;\n pad: 'valid'|'same'|number;\n dataFormat: 'NHWC'|'NCHW';\n dilations: [number,
number]|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\n\nexport const
DepthwiseConv2dNativeBackpropFilter = 'DepthwiseConv2dNativeBackpropFilter';\nexport type
DepthwiseConv2dNativeBackpropFilterInputs =\n Pick<NamedTensorInfoMap, 'x'|'dy'>;\nexport interface
DepthwiseConv2dNativeBackpropFilterAttrs {\n strides: [number, number]|number;\n dilations: [number,
number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n filterShape: [number,
number, number, number];\n}\n\n\nexport const DepthwiseConv2dNativeBackpropInput =\n
'DepthwiseConv2dNativeBackpropInput';\nexport type DepthwiseConv2dNativeBackpropInputInputs =\n

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Pick<NamedTensorInfoMap, 'dy'|'filter'>;\nexport interface DepthwiseConv2dNativeBackpropInputAttrs {\n
strides: [number, number]|number;\n dilations: [number, number]|number;\n pad: 'valid'|'same'|number;\n
dimRoundingMode?: 'floor'|'round'|'ceil';\n inputShape: [number, number, number, number];\n}\n\nexport const
Diag = 'Diag';\nexport type DiagInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Dilation2D =
'Dilation2D';\nexport type Dilation2DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface
Dilation2DAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dilations: [number,
number]|number;\n}\n\nexport const Dilation2DBackpropInput = 'Dilation2DBackpropInput';\nexport type
Dilation2DBackpropInputInputs =\n  Pick<NamedTensorInfoMap, 'x'|'filter'|'dy'>;\n\nexport const
Dilation2DBackpropFilter = 'Dilation2DBackpropFilter';\nexport type Dilation2DBackpropFilterInputs =\n
Pick<NamedTensorInfoMap, 'x'|'filter'|'dy'>;\n\nexport const RealDiv = 'RealDiv';\nexport type RealDivInputs =
BinaryInputs;\n\nexport const Elu = 'Elu';\nexport type EluInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport
const EluGrad = 'EluGrad';\nexport type EluGradInputs = Pick<NamedTensorInfoMap, 'dy'|'y'>;\n\nexport const Erf
= 'Erf';\nexport type ErfInputs = UnaryInputs;\n\nexport const Equal = 'Equal';\nexport type EqualInputs =
BinaryInputs;\n\nexport const Exp = 'Exp';\nexport type ExpInputs = UnaryInputs;\n\nexport const ExpandDims =
'ExpandDims';\nexport type ExpandDimsInputs = Pick<NamedTensorInfoMap, 'input'>;\nexport interface
ExpandDimsAttrs {\n dim: number;\n}\n\nexport const Expml = 'Expml';\nexport type ExpmlInputs =
UnaryInputs;\n\nexport const FFT = 'FFT';\nexport type FFTInputs = Pick<NamedTensorInfoMap,
'input'>;\n\nexport const Fill = 'Fill';\nexport interface FillAttrs {\n shape: number[];\n value: number|string;\n
dtype: DataType;\n}\n\nexport const FlipLeftRight = 'FlipLeftRight';\nexport type FlipLeftRightInputs =
Pick<NamedTensorInfoMap, 'image'>;\n\nexport const Floor = 'Floor';\nexport type FloorInputs =
UnaryInputs;\n\nexport const FloorDiv = 'FloorDiv';\nexport type FloorDivInputs = BinaryInputs;\n\nexport const
FusedBatchNorm = 'FusedBatchNorm';\nexport type FusedBatchNormInputs =\n  Pick<NamedTensorInfoMap,
'x'|'scale'|'offset'|'mean'|'variance'>;\nexport interface FusedBatchNormAttrs {\n varianceEpsilon:
number;\n}\n\nexport const GatherV2 = 'GatherV2';\nexport type GatherV2Inputs = Pick<NamedTensorInfoMap,
'x'|'indices'>;\nexport interface GatherV2Attrs {\n axis: number;\n batchDims: number;\n}\n\nexport const
GatherNd = 'GatherNd';\nexport type GatherNdInputs = Pick<NamedTensorInfoMap, 'params'|'indices'>;\n\nexport
const Greater = 'Greater';\nexport type GreaterInputs = BinaryInputs;\n\nexport const GreaterEqual =
'GreaterEqual';\nexport type GreaterEqualInputs = BinaryInputs;\n\nexport const Identity = 'Identity';\nexport type
IdentityInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const IFFT = 'IFFT';\nexport type IFFTInputs =
Pick<NamedTensorInfoMap, 'input'>;\n\nexport const Imag = 'Imag';\nexport type ImagInputs =
Pick<NamedTensorInfoMap, 'input'>;\n\nexport const IsFinite = 'IsFinite';\nexport type IsFiniteInputs =
UnaryInputs;\n\nexport const IsInf = 'IsInf';\nexport type IsInfInputs = UnaryInputs;\n\nexport const IsNan =
'IsNan';\nexport type IsNanInputs = UnaryInputs;\n\nexport const LeakyRelu = 'LeakyRelu';\nexport type
LeakyReluInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface LeakyReluAttrs {\n alpha:
number;\n}\n\nexport const Less = 'Less';\nexport type LessInputs = BinaryInputs;\n\nexport const LessEqual =
'LessEqual';\nexport type LessEqualInputs = BinaryInputs;\n\nexport const LinSpace = 'LinSpace';\nexport interface
LinSpaceAttrs {\n start: number;\n stop: number;\n num: number;\n}\n\nexport const Log = 'Log';\nexport type
LogInputs = UnaryInputs;\n\nexport const Log1p = 'Log1p';\nexport type Log1pInputs = UnaryInputs;\n\nexport
const LogicalAnd = 'LogicalAnd';\nexport type LogicalAndInputs = BinaryInputs;\n\nexport const LogicalNot =
'LogicalNot';\nexport type LogicalNotInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const LogicalOr =
'LogicalOr';\nexport type LogicalOrInputs = BinaryInputs;\n\nexport const LogSoftmax = 'LogSoftmax';\nexport
type LogSoftmaxInputs = Pick<NamedTensorInfoMap, 'logits'>;\nexport interface LogSoftmaxAttrs {\n axis:
number;\n}\n\nexport const LRN = 'LRN';\nexport type LRNInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport
interface LRNAttrs {\n depthRadius: number;\n bias: number;\n alpha: number;\n beta: number;\n}\n\nexport
const LRNGrad = 'LRNGrad';\nexport type LRNGradInputs = Pick<NamedTensorInfoMap, 'x'|'y'|'dy'>;\nexport
interface LRNGradAttrs {\n depthRadius: number;\n bias: number;\n alpha: number;\n beta:
number;\n}\n\nexport const Max = 'Max';\nexport type MaxInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport
interface MaxAttrs {\n reductionIndices: number|number[];\n keepDims: boolean;\n}\n\nexport const Maximum =

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'Maximum';\nextport type MaximumInputs = BinaryInputs;\nextport const MaxPool = 'MaxPool';\nextport type
MaxPoolInputs = Pick<NamedTensorInfoMap, 'x'>;\nextport interface MaxPoolAttrs {\n filterSize: [number,
number]]number;\n strides: [number, number]]number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?:
'floor'|'round'|'ceil';\n}\nextport const MaxPoolGrad = 'MaxPoolGrad';\nextport type MaxPoolGradInputs =
Pick<NamedTensorInfoMap, 'dy'|'input'|'output'>;\nextport interface MaxPoolGradAttrs {\n filterSize: [number,
number]]number;\n strides: [number, number]]number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?:
'floor'|'round'|'ceil';\n}\nextport const MaxPool3D = 'MaxPool3D';\nextport type MaxPool3DInputs =
Pick<NamedTensorInfoMap, 'x'>;\nextport interface MaxPool3DAttrs {\n filterSize: [number, number,
number]]number;\n strides: [number, number, number]]number;\n pad: 'valid'|'same'|number;\n dataFormat:
'NDHWC'|'NCDHW';\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\nextport const MaxPool3DGrad =
'MaxPool3DGrad';\nextport type MaxPool3DGradInputs =\n Pick<NamedTensorInfoMap,
'dy'|'input'|'output'>;\nextport interface MaxPool3DGradAttrs {\n filterSize: [number, number, number]]number;\n
strides: [number, number, number]]number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?:
'floor'|'round'|'ceil';\n}\nextport const MaxPoolWithArgmax = 'MaxPoolWithArgmax';\nextport type
MaxPoolWithArgmaxInputs = Pick<NamedTensorInfoMap, 'x'>;\nextport interface MaxPoolWithArgmaxAttrs {\n
filterSize: [number, number]]number;\n strides: [number, number]]number;\n pad: 'valid'|'same'|number;\n
includeBatchInIndex: boolean;\n}\nextport const Mean = 'Mean';\nextport type MeanInputs =
Pick<NamedTensorInfoMap, 'x'>;\nextport interface MeanAttrs {\n axis: number|number[];\n keepDims:
boolean;\n}\nextport const Min = 'Min';\nextport type MinInputs = Pick<NamedTensorInfoMap, 'x'>;\nextport
interface MinAttrs {\n axis: number|number[];\n keepDims: boolean;\n}\nextport const Minimum =
'Minimum';\nextport type MinimumInputs = BinaryInputs;\nextport const MirrorPad = 'MirrorPad';\nextport type
MirrorPadInputs = Pick<NamedTensorInfoMap, 'x'>;\nextport interface MirrorPadAttrs {\n paddings:
Array<[number, number]>;\n mode: 'reflect'|'symmetric';\n}\nextport const Mod = 'Mod';\nextport type ModInputs
= BinaryInputs;\nextport const Multinomial = 'Multinomial';\nextport type MultinomialInputs =
Pick<NamedTensorInfoMap, 'logits'>;\nextport interface MultinomialAttrs {\n numSamples: number;\n seed:
number;\n normalized: boolean;\n}\nextport const Multiply = 'Multiply';\nextport type MultiplyInputs =
BinaryInputs;\nextport const Neg = 'Neg';\nextport type NegInputs = UnaryInputs;\nextport const NotEqual =
'NotEqual';\nextport type NotEqualInputs = BinaryInputs;\nextport const NonMaxSuppressionV3 =
'NonMaxSuppressionV3';\nextport type NonMaxSuppressionV3Inputs =\n Pick<NamedTensorInfoMap,
'boxes'|'scores'>;\nextport interface NonMaxSuppressionV3Attrs {\n maxOutputSize: number;\n iouThreshold:
number;\n scoreThreshold: number;\n}\nextport const NonMaxSuppressionV4 =
'NonMaxSuppressionV4';\nextport type NonMaxSuppressionV4Inputs =\n Pick<NamedTensorInfoMap,
'boxes'|'scores'>;\nextport interface NonMaxSuppressionV4Attrs {\n maxOutputSize: number;\n iouThreshold:
number;\n scoreThreshold: number;\n padToMaxOutputSize: boolean;\n}\nextport const NonMaxSuppressionV5
= 'NonMaxSuppressionV5';\nextport type NonMaxSuppressionV5Inputs =\n Pick<NamedTensorInfoMap,
'boxes'|'scores'>;\nextport interface NonMaxSuppressionV5Attrs {\n maxOutputSize: number;\n iouThreshold:
number;\n scoreThreshold: number;\n softNmsSigma: number;\n}\nextport const OnesLike = 'OnesLike';\nextport
type OnesLikeInputs = UnaryInputs;\nextport const OneHot = 'OneHot';\nextport type OneHotInputs =
Pick<NamedTensorInfoMap, 'indices'>;\nextport interface OneHotAttrs {\n depth: number;\n onValue: number;\n
offValue: number;\n}\nextport const Pack = 'Pack';\nextport type PackInputs = TensorInfo[];\nextport interface
PackAttrs {\n axis: number;\n}\nextport const PadV2 = 'PadV2';\nextport type PadV2Inputs =
Pick<NamedTensorInfoMap, 'x'>;\nextport interface PadV2Attrs {\n paddings: Array<[number, number]>;\n
constantValue: number;\n}\nextport const Pool = 'Pool';\nextport type PoolInputs = Pick<NamedTensorInfoMap,
'input'>;\nextport const Pow = 'Pow';\nextport type PowInputs = BinaryInputs;\nextport const Prelu =
'Prelu';\nextport type PreluInputs = Pick<NamedTensorInfoMap, 'x'|'alpha'>;\nextport const Prod = 'Prod';\nextport
type ProdInputs = Pick<NamedTensorInfoMap, 'x'>;\nextport interface ProdAttrs {\n axis: number|number[];\n
keepDims: boolean;\n}\nextport const Range = 'Range';\nextport interface RangeAttrs {\n start: number;\n stop:
number;\n step: number;\n dtype: 'float32'|'int32';\n}\nextport const Real = 'Real';\nextport type RealInputs =

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Pick<NamedTensorInfoMap, 'input'>;\n\nexport const Reciprocal = 'Reciprocal';\nexport type ReciprocalInputs =
UnaryInputs;\n\nexport const Relu = 'Relu';\nexport type ReluInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport
const Reshape = 'Reshape';\nexport type ReshapeInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
ReshapeAttrs {\n  shape: number[];\n}\n\nexport const ResizeNearestNeighbor = 'ResizeNearestNeighbor';\nexport
type ResizeNearestNeighborInputs = Pick<NamedTensorInfoMap, 'images'>;\nexport interface
ResizeNearestNeighborAttrs {\n  alignCorners: boolean;\n  halfPixelCenters: boolean;\n  size: [number,
number];\n}\n\nexport const ResizeNearestNeighborGrad = 'ResizeNearestNeighborGrad';\nexport type
ResizeNearestNeighborGradInputs =\n  Pick<NamedTensorInfoMap, 'images''dy'>;\nexport type
ResizeNearestNeighborGradAttrs = ResizeNearestNeighborAttrs;\n\nexport const ResizeBilinear =
'ResizeBilinear';\nexport type ResizeBilinearInputs = Pick<NamedTensorInfoMap, 'images'>;\nexport interface
ResizeBilinearAttrs {\n  alignCorners: boolean;\n  halfPixelCenters: boolean;\n  size: [number,
number];\n}\n\nexport const ResizeBilinearGrad = 'ResizeBilinearGrad';\nexport type ResizeBilinearGradInputs =
Pick<NamedTensorInfoMap, 'images''dy'>;\nexport type ResizeBilinearGradAttrs = ResizeBilinearAttrs;\n\nexport
const Relu6 = 'Relu6';\nexport type Relu6Inputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Reverse =
'Reverse';\nexport type ReverseInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ReverseAttrs {\n  dims:
number|number[];\n}\n\nexport const Round = 'Round';\nexport type RoundInputs = UnaryInputs;\n\nexport const
Rsqrt = 'Rsqrt';\nexport type RsqrtInputs = UnaryInputs;\n\nexport const ScatterNd = 'ScatterNd';\nexport type
ScatterNdInputs = Pick<NamedTensorInfoMap, 'indices''updates'>;\nexport interface ScatterNdAttrs {\n  shape:
number[];\n}\n\nexport const Select = 'Select';\nexport type SelectInputs = Pick<NamedTensorInfoMap,
'condition''t''e'>;\n\nexport const Selu = 'Selu';\nexport type SeluInputs = Pick<NamedTensorInfoMap,
'x'>;\n\nexport const Slice = 'Slice';\nexport type SliceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
SliceAttrs {\n  begin: number|number[];\n  size: number|number[];\n}\n\nexport const Sin = 'Sin';\nexport type
SinInputs = UnaryInputs;\n\nexport const Sinh = 'Sinh';\nexport type SinhInputs = UnaryInputs;\n\nexport const
Sign = 'Sign';\nexport type SignInputs = UnaryInputs;\n\nexport const Sigmoid = 'Sigmoid';\nexport type
SigmoidInputs = UnaryInputs;\n\nexport const Softplus = 'Softplus';\nexport type SoftplusInputs =
UnaryInputs;\n\nexport const Sqrt = 'Sqrt';\nexport type SqrtInputs = UnaryInputs;\n\nexport const Sum =
'Sum';\nexport type SumInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface SumAttrs {\n  axis:
number|number[];\n  keepDims: boolean;\n}\n\nexport const SpaceToBatchND = 'SpaceToBatchND';\nexport type
SpaceToBatchNDInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface SpaceToBatchNDAttrs {\n  blockShape:
number[];\n  paddings: number[][];\n}\n\nexport const SplitV = 'SplitV';\nexport type SplitVInputs =
Pick<NamedTensorInfoMap, 'x'>;\nexport interface SplitVAttrs {\n  numOrSizeSplits: number[]|number;\n  axis:
number;\n}\n\nexport const Softmax = 'Softmax';\nexport type SoftmaxInputs = Pick<NamedTensorInfoMap,
'logits'>;\nexport interface SoftmaxAttrs {\n  dim: number;\n}\n\nexport const SquaredDifference =
'SquaredDifference';\nexport type SquaredDifferenceInputs = BinaryInputs;\n\nexport const Square =
'Square';\nexport type SquareInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Sub = 'Sub';\nexport type
SubInputs = BinaryInputs;\n\nexport const SparseToDense = 'SparseToDense';\nexport type SparseToDenseInputs
=\n  Pick<NamedTensorInfoMap, 'sparseIndices''sparseValues''defaultValue'>;\nexport interface
SparseToDenseAttrs {\n  outputShape: number[];\n}\n\nexport const StridedSlice = 'StridedSlice';\nexport type
StridedSliceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface StridedSliceAttrs {\n  begin: number[];\n
end: number[];\n  strides: number[];\n  beginMask: number;\n  endMask: number;\n  ellipsisMask: number;\n
newAxisMask: number;\n  shrinkAxisMask: number;\n}\n\nexport const Tan = 'Tan';\nexport type TanInputs =
UnaryInputs;\n\nexport const Tanh = 'Tanh';\nexport type TanhInputs = UnaryInputs;\n\nexport const Tile =
'Tile';\nexport type TileInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface TileAttrs {\n  reps:
number[];\n}\n\nexport const TopK = 'TopK';\nexport type TopKInputs = Pick<NamedTensorInfoMap,
'x'>;\nexport interface TopKAttrs {\n  k: number;\n  sorted: boolean;\n}\n\nexport const Transpose =
'Transpose';\nexport type TransposeInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface TransposeAttrs {\n
perm: number[];\n}\n\nexport const Unique = 'Unique';\nexport type UniqueInputs = Pick<NamedTensorInfoMap,
'x'>;\nexport interface UniqueAttrs {\n  axis: number;\n}\n\nexport type UnaryInputs =

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Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Unpack = 'Unpack';\nexport type UnpackInputs =
Pick<NamedTensorInfoMap, 'value'>;\nexport interface UnpackAttrs {\n  axis: number;\n}\n\nexport const
UnsortedSegmentSum = 'UnsortedSegmentSum';\nexport type UnsortedSegmentSumInputs =\nPick<NamedTensorInfoMap, 'x'|'segmentIds'>;\nexport interface UnsortedSegmentSumAttrs {\n  numSegments:
number;\n}\n\nexport const ZerosLike = 'ZerosLike';\nexport type ZerosLikeInputs = UnaryInputs;\n\n/**\n *
TensorFlow.js-only kernels\n */\nexport const Step = 'Step';\nexport type StepInputs = UnaryInputs;\nexport
interface StepAttrs {\n  alpha: number;\n}\n\nexport const FromPixels = 'FromPixels';\nexport interface
FromPixelsInputs {\n  pixels: PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n  HTMLVideoElement|ImageBitmap;\n}\n\nexport interface FromPixelsAttrs {\n  numChannels: number;\n}\n\nexport
const RotateWithOffset = 'RotateWithOffset';\nexport type RotateWithOffsetInputs = Pick<NamedTensorInfoMap,
'image'>;\nexport interface RotateWithOffsetAttrs {\n  radians: number;\n  fillValue: number|[number, number,
number];\n  center: number|[number, number];\n}\n\nexport const _FusedMatMul = '_FusedMatMul';\n\n//
tslint:disable-next-line: class-name\nexport interface _FusedMatMulInputs extends NamedTensorInfoMap {\n  a:
TensorInfo;\n  b: TensorInfo;\n  bias?: TensorInfo;\n  preluActivationWeights?: TensorInfo;\n}\n\n//
tslint:disable-next-line: class-name\nexport interface _FusedMatMulAttrs {\n  transposeA: boolean;\n  transposeB: boolean;\n
activation: Activation;\n  leakyreluAlpha?: number;\n}\n\nexport const FusedConv2D = 'FusedConv2D';\nexport
interface FusedConv2DInputs extends NamedTensorInfoMap {\n  x: TensorInfo;\n  filter: TensorInfo;\n  bias?:
TensorInfo;\n  preluActivationWeights?: TensorInfo;\n}\n\nexport interface FusedConv2DAttrs {\n  strides: [number,
number]|number;\n  pad: 'valid'|'same'|number|ExplicitPadding;\n  dataFormat: 'NHWC'|'NCHW';\n  dilations:
[number, number]|number;\n  dimRoundingMode: 'floor'|'round'|'ceil';\n  activation: Activation;\n  leakyreluAlpha?:
number;\n}\n\nexport const FusedDepthwiseConv2D = 'FusedDepthwiseConv2D';\nexport interface
FusedDepthwiseConv2DInputs extends NamedTensorInfoMap {\n  x: TensorInfo;\n  filter: TensorInfo;\n  bias?:
TensorInfo;\n  preluActivationWeights?: TensorInfo;\n}\n\nexport interface FusedDepthwiseConv2DAttrs {\n
  strides: [number, number]|number;\n  pad: 'valid'|'same'|number;\n  dataFormat: 'NHWC'|'NCHW';\n  dilations:
[number, number]|number;\n  dimRoundingMode: 'floor'|'round'|'ceil';\n  activation: Activation;\n  leakyreluAlpha?:
number;\n}\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

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*/\nimport {env} from './environment';\nimport {getGlobal} from './global_util';\nimport {NamedGradientMap}
from './tape';\nimport {Tensor} from './tensor';\nimport {DataType, RecursiveArray} from './types';\n\nconst
kernelRegistry =\n  getGlobal('kernelRegistry', () => new Map<string, KernelConfig>());\nconst gradRegistry =\n  getGlobal('gradRegistry', () => new Map<string, GradConfig>());\n\nexport type DataId = object;\n\nntype
AttributeValue =\n  number|number[]|boolean|boolean[]|string|string[]|NamedAttrMap;\n\n/** These are extra non-
tensor/primitive params passed to kernel functions. */\nexport type Attribute =
AttributeValue|RecursiveArray<AttributeValue>;\n\n/** Specifies the code to run when executing a kernel.
*/\nexport type KernelFunc = (params: {\n  inputs: NamedTensorInfoMap,\n  backend: {},\n  attrs?:
NamedAttrMap,\n}) => TensorInfo|TensorInfo[];\n\n/** The function to run when computing a gradient during
backprop. */\nexport type GradFunc =\n  (dy: Tensor|Tensor[], saved: Tensor[], attrs: NamedAttrMap) =>\n  NamedGradientMap;\n\n/** Function that gets called after the backend initializes. */\nexport type KernelSetupFunc
= (backend: {}) => void;\n\n/** Function that gets called right before the backend is disposed. */\nexport type
KernelDisposeFunc = KernelSetupFunc;\n\n/** Config object for registering a kernel in the global registry.
*/\nexport interface KernelConfig {\n  kernelName: string;\n  backendName: string;\n  kernelFunc: KernelFunc;\n  setupFunc?: KernelSetupFunc;\n  disposeFunc?: KernelDisposeFunc;\n}\n\n/** Config object for registering a

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gradient in the global registry. */\nexport interface GradConfig {\n  kernelName: string;\n  inputsToSave?:
string[];\n  // When saveAllInputs is true, all inputs will be saved. Only use this flag\n  // if inputs is an array of
Tensors.\n  saveAllInputs?: boolean;\n  outputsToSave?: boolean[];\n  gradFunc: GradFunc;\n}\n\n/** Holds
metadata for a given tensor. */\nexport interface TensorInfo {\n  dataId: DataId;\n  shape: number[];\n  dtype:
DataType;\n}\n\nexport interface NamedTensorInfoMap {\n  [name: string]: TensorInfo;\n}\n\nexport interface
NamedAttrMap {\n  [name: string]: Attribute;\n}\n\n/**\n * Returns the kernel function (code) associated with the
provided names.\n * @param kernelName The official name of the kernel.\n * @param backendName The
official name of the backend.\n */\nexport function getKernel(\n  kernelName: string, backendName: string):
KernelConfig {\n  const key = makeKey(kernelName, backendName);\n  return kernelRegistry.get(key);\n}\n\n/**\n * Returns the registered gradient info associated with the provided kernel.\n * @param kernelName The official TF
kernel name.\n */\nexport function getGradient(kernelName: string): GradConfig {\n  return
gradRegistry.get(kernelName);\n}\n\nexport function getKernelsForBackend(backendName: string): KernelConfig[]
{\n  const it = kernelRegistry.entries();\n  const result: KernelConfig[] = [];\n  while (true) {\n    const {done,
value} = it.next();\n    if (done) {\n      break;\n    }\n    const [key, config] = value;\n    const [backend, ] =
key.split('_');\n    if (backend === backendName) {\n      result.push(config);\n    }\n  }\n  return result;\n}\n\n/**\n * Registers the function (forward pass) for the kernel in a global registry.\n * @param config A config object with
the following properties:\n * - `kernelName` The official name of the kernel.\n * - `backendName` The official
name of the backend.\n * - `kernelFunc` The function to run during the forward pass of the kernel.\n * - `setupFunc`
Optional. Gets called once, after the backend initializes.\n * - `disposeFunc` Optional. Gets called once, right before
the backend is\n * disposed.\n */\nexport function registerKernel(config: KernelConfig) {\n  const {kernelName,
backendName} = config;\n  const key = makeKey(kernelName, backendName);\n  if (kernelRegistry.has(key)) {\n
console.warn(\n    `The kernel '${kernelName}' for backend ` +\n    ` '${backendName}' is already
registered`);\n  }\n  kernelRegistry.set(key, config);\n}\n\n/**\n * Registers a gradient function for a given kernel in
the global registry,\n * to be used during the back-propagation of that kernel.\n * @param config An object with
the following properties:\n * - `kernelName` The name of the kernel that the gradient function is for.\n * -
`gradFunc` The function to run during back-propagation.\n */\nexport function registerGradient(config: GradConfig)
{\n  const {kernelName} = config;\n  if (gradRegistry.has(kernelName)) {\n    // TODO (yassogba) after 3.0 assess
whether we need to keep this gated\n    // to debug mode.\n    if (env().getBool('DEBUG')) {\n
console.warn(`Overriding the gradient for '${kernelName}'`);\n    }\n  }\n  gradRegistry.set(kernelName,
config);\n}\n\n/**\n * Removes the kernel function from the registry.\n * @param kernelName The official
name of the kernel.\n * @param backendName The official name of the backend.\n */\nexport function
unregisterKernel(\n  kernelName: string, backendName: string): void {\n  const key = makeKey(kernelName,
backendName);\n  if (!kernelRegistry.has(key)) {\n    throw new Error(\n      `The kernel '${kernelName}' for
backend ` +\n      ` '${backendName}' is not registered`);\n  }\n  kernelRegistry.delete(key);\n}\n\n/**\n * Removes the
registered gradient from the global registry. */\nexport function unregisterGradient(kernelName: string): void {\n
if (!gradRegistry.has(kernelName)) {\n  throw new Error(\n    `The gradient '${kernelName}' for backend is not
registered`);\n  }\n  gradRegistry.delete(kernelName);\n}\n\n/**\n * Finds kernels that have already been registered
to a backend and re-registers\n * them for a new backend. Useful for registering custom backends.\n * @param
registeredBackendName Already registered backend.\n * @param newBackendName New backend.\n */\nexport
function copyRegisteredKernels(\n  registeredBackendName: string, newBackendName: string): void {\n  const
kernels = getKernelsForBackend(registeredBackendName);\n  kernels.forEach(kernelConfig => {\n    const
newKernelConfig =\n      Object.assign({}, kernelConfig, {backendName: newBackendName});\n    registerKernel(newKernelConfig);\n  });\n}\n\nfunction makeKey(kernelName: string, backendName: string) {\n
return `${backendName}_${kernelName}`;\n}\n\n", "*/\n * @license\n * Copyright 2017 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES

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OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

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*/\n\nimport {env} from './environment';\nimport {BackendValues, DataType, TensorLike, TypedArray} from './types';\nimport * as base from './util_base';\nexport * from './util_base';\n\n/**\n * Create typed array for scalar value. Used for storing in `DataStorage`.\n */\nexport function createScalarValue(value: DataType, dtype: DataType): BackendValues {\n  if (dtype === 'string') {\n    return encodeString(value);\n  }\n  return toTypedArray([value], dtype);\n}\n\nfunction noConversionNeeded(a: TensorLike, dtype: DataType): boolean {\n  return (a instanceof Float32Array && dtype === 'float32') ||\n    (a instanceof Int32Array && dtype === 'int32') ||\n    (a instanceof Uint8Array && dtype === 'bool');\n}\n\nexport function toTypedArray(a: TensorLike, dtype: DataType): TypedArray {\n  if (dtype === 'string') {\n    throw new Error('Cannot convert a string[] to a TypedArray');\n  }\n  if (Array.isArray(a)) {\n    a = base.flatten(a);\n  }\n  if (env().getBool('DEBUG')) {\n    base.checkConversionForErrors(a as number[], dtype);\n  }\n  if (noConversionNeeded(a, dtype)) {\n    return a as TypedArray;\n  }\n  if (dtype == null || dtype === 'float32' || dtype === 'complex64') {\n    return new Float32Array(a as number[]);\n  } else if (dtype === 'int32') {\n    return new Int32Array(a as number[]);\n  } else if (dtype === 'bool') {\n    const bool = new Uint8Array((a as number[]).length);\n    for (let i = 0; i < bool.length; ++i) {\n      if (Math.round((a as number[])[i]) !== 0) {\n        bool[i] = 1;\n      }\n    }\n    return bool;\n  } else {\n    throw new Error(`Unknown data type ${dtype}`);\n  }\n}\n\n/**\n * Returns the current high-resolution time in milliseconds relative to an\n * arbitrary time in the past. It works across different platforms (node.js,\n * browsers).\n */\nconsole.log(tf.util.now());\n\n/**\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function now(): number {\n  return env().platform.now();\n}\n\n/**\n * Returns a platform-specific implementation of\n * `fetch` (https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API).\n * If `fetch` is defined on the global object (`window`, `process`, etc.),\n * `tf.util.fetch` returns that function. If not, `tf.util.fetch`\n * returns a platform-specific solution.\n */\nconst resource = await\n  tf.util.fetch('https://unpkg.com/@tensorflow/tfjs');\n\n/**\n * // handle response\n */\n\n/**\n * @doc {heading: 'Util'}\n */\nexport function fetch(path: string, requestInits?: RequestInit): Promise<Response> {\n  return env().platform.fetch(path, requestInits);\n}\n\n/**\n * Encodes the provided string into bytes using the provided encoding scheme.\n * @param s The string to encode.\n * @param encoding The encoding scheme. Defaults to utf-8.\n */\nexport function encodeString(s: string, encoding = 'utf-8'): Uint8Array {\n  encoding = encoding || 'utf-8';\n  return env().platform.encode(s, encoding);\n}\n\n/**\n * Decodes the provided bytes into a string using the provided encoding scheme.\n * @param bytes The bytes to decode.\n * @param encoding The encoding scheme. Defaults to utf-8.\n */\nexport function decodeString(bytes: Uint8Array, encoding = 'utf-8'): string {\n  encoding = encoding || 'utf-8';\n  return env().platform.decode(bytes, encoding);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
```

```
*/\n\nimport {BackendTimer, BackendTimingInfo} from './backends/backend';\nimport {env} from './environment';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {DataType, DataTypeMap, TypedArray} from './types';\nimport * as util from './util';\n\nexport type KernelProfile = {\n  kernelName: string,\n  outputs: Tensor[],\n  inputs: NamedTensorMap,\n  timeMs: Promise<number | {error: string}>,\n  extraInfo: Promise<string>};\n\nexport class Profiler {\n  constructor(private backendTimer: BackendTimer, private logger?: Logger) {\n    if (logger == null) {\n      this.logger = new Logger();\n    }\n  }\n\n  profileKernel(kernelName: string, inputs: NamedTensorMap, f: () => Tensor[]):\n    KernelProfile {\n    let outputs;
```

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Tensor[];
const holdResultWrapperFn = () => {
  outputs = f();
};
let timer:
Promise<BackendTimingInfo>;
const start = util.now();
if (this.backendTimer.timerAvailable()) {
  timer = this.backendTimer.time(holdResultWrapperFn);
} else {
  holdResultWrapperFn();
outputs.map(output => output.dataSync());
  timer = Promise.resolve({kernelMs: util.now() - start});
}
if (env().getBool('CHECK_COMPUTATION_FOR_ERRORS')) {
  for (let i = 0; i < outputs.length; i++) {
    const output = outputs[i];
    // Dangling promise here because we don't want to propagate up
    // asynchronicity.
    output.data().then(tensorVals => {
      checkComputationForErrors(tensorVals,
        output.dtype, kernelName);
    });
  }
}
const kernelProfile = {
  kernelName,
  outputs,
  inputs,
  timeMs: timer.then(timing => timing.kernelMs),
  extraInfo: timer.then(timing => timing.getExtraProfileInfo() != null ?
    timing.getExtraProfileInfo() : "")
};
return kernelProfile;
}
logKernelProfile(kernelProfile: KernelProfile): void {
  const {kernelName, outputs, timeMs, inputs, extraInfo} = kernelProfile;
  outputs.forEach(result => {
    Promise.all([result.data(), timeMs, extraInfo]).then(valueContainer => {
      this.logger.logKernelProfile(kernelName, result, valueContainer[0], valueContainer[1], inputs, valueContainer[2]);
    });
  });
}
export function checkComputationForErrors<D extends DataType>(
  vals: DataTypeMap[D], dtype: D, kernelName: string): boolean {
  if (dtype !== 'float32') {
    // Only floating point computations will generate NaN values
    return false;
  }
  for (let i = 0; i < vals.length; i++) {
    const num = vals[i] as number;
    if (isNaN(num) || !isFinite(num)) {
      // Throwing custom exception so behavior is testable.
      console.warn(`Found ${num} in the result of '${kernelName}'`);
      return true;
    }
  }
  return false;
}
export class Logger {
  logKernelProfile(
    name: string, result: Tensor, vals: TypedArray, timeMs: number | {error: string}, inputs: NamedTensorMap, extraInfo?: string) {
    const time = typeof timeMs === 'number' ? util.rightPad(`${timeMs}ms`, 9) : timeMs['error'];
    const paddedName = util.rightPad(name, 25);
    const rank = result.rank;
    const size = result.size;
    const shape = util.rightPad(result.shape.toString(), 14);
    let inputShapesDescription = "";
    for (const name in inputs) {
      const input = inputs[name];
      if (input != null) {
        // The input might be a non-tensor (e.g HTMLImageElement), in which case
        // we claim the output shape as input shape.
        const inputShape = input.shape || result.shape;
        const inputRank = inputShape.length;
        inputShapesDescription += `${name}: ${inputRank}D ${inputRank > 0 ? inputShape : ""}`;
      }
    }
    console.log(`%c${paddedName} \\t%c${time} \\t%c${rank}D ${shape} \\t%c${size} \\t%c${inputShapesDescription} \\t%c${extraInfo}`,
      'font-weight:bold', 'color:red', 'color:blue', 'color: orange', 'color: green', 'color: steelblue');
  }
}
/**
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 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
 * either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
=====
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import * as util from './util';
export interface TapeNode {
  id: number;
  kernelName: string;
  outputs: Tensor[];
  inputs: NamedTensorMap;
  // Optional params, defined only for ops with gradient impl.
  gradient?: (dys: Tensor[]) => NamedGradientMap;
  saved?: Tensor[];
}
export type NamedGradientMap = {
  [inputName: string]: () => Tensor;
};
/**
 * Computes a list of TapeNodes that connect x to y, filtering everything else
 * out and preserving the order of the original tape elements.
 * @param tape The tape elements to filter.
 * @param xs The input Tensors.
 * @param y The output Tensor.
 */
export function getFilteredNodesXTToY(
  tape: TapeNode[], xs: Tensor[], y: Tensor): TapeNode[] {
  // Forward pass to compute all the nodes and Tensors that are transitively a
  // function of x.
  const tensorsFromX: {[tensorId: number]: boolean} = {};
  const nodesFromX: {[nodeId: number]: boolean} = {};
  for (let i = 0; i < xs.length; i++) {
    tensorsFromX[xs[i].id] = true;
  }
}

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for (let i = 0; i < tape.length; i++) {\n  const node = tape[i];\n  const nodeInputs = node.inputs;\n  for (const\n  inputName in nodeInputs) {\n    const input = nodeInputs[inputName];\n    let anyInputFromX = false;\n    for\n    (let j = 0; j < xs.length; j++) {\n      if (tensorsFromX[input.id]) {\n        node.outputs.forEach(output =>\n        tensorsFromX[output.id] = true);\n        anyInputFromX = true;\n        nodesFromX[node.id] = true;\n        break;\n      }\n    }\n    if (anyInputFromX) {\n      break;\n    }\n  }\n  // Backward pass to find all of\n  the nodes and Tensors that lead to y.\n  const tensorsLeadToY: {[tensorId: number]: boolean} = {};\n  tensorsLeadToY[y.id] = true;\n  const nodesToY: {[nodeId: number]: boolean} = {};\n  for (let i = tape.length - 1;\n  i >= 0; i--) {\n    const node = tape[i];\n    const nodeInputs = node.inputs;\n    // If any of the outputs lead to y,\n    mark all of the inputs as leading to y.\n    for (let j = 0; j < node.outputs.length; j++) {\n      if\n      (tensorsLeadToY[node.outputs[j].id]) {\n        for (const inputName in nodeInputs) {\n          tensorsLeadToY[nodeInputs[inputName].id] = true;\n          nodesToY[node.id] = true;\n        }\n        break;\n      }\n    }\n  }\n  // Return the paths that come from x and lead to y.\n  const filteredTape: TapeNode[] = [];\n  for (let\n  i = 0; i < tape.length; i++) {\n    const node = tape[i];\n    if (nodesFromX[node.id] && nodesToY[node.id]) {\n      // Prune the inputs from the node that aren't a function of x.\n      const prunedInputs: {[inputName: string]: Tensor}\n      = {};\n      for (const inputName in node.inputs) {\n        const nodeInput = node.inputs[inputName];\n        if\n        (tensorsFromX[nodeInput.id]) {\n          prunedInputs[inputName] = nodeInput;\n        }\n      }\n      // Copy the\n      node and overwrite inputsAndArgs to the pruned version.\n      const prunedNode = Object.assign({}, node);\n      prunedNode.inputs = prunedInputs;\n      prunedNode.outputs = node.outputs;\n      filteredTape.push(prunedNode);\n    }\n  }\n  return filteredTape;\n}\n\n/**\n * Backpropagate gradients through\n the filtered TapeNodes.\n *\n * @param tensorAccumulatedGradientMap A map of Tensor to its gradient. This\n map\n * is mutated by this method.\n *\n * @param filteredTape The filtered TapeNodes to backprop through.\n *\n * @export function backpropagateGradients(\n  tensorAccumulatedGradientMap: {[tensorId: number]: Tensor},\n  filteredTape: TapeNode[],\n  tidy: (f: Function) => Tensor,\n  add: (a: Tensor, b: Tensor) => Tensor) {\n  // Walk the\n  tape backward and keep a map of Tensor to its gradient.\n  for (let i = filteredTape.length - 1; i >= 0; i--) {\n    const\n    node = filteredTape[i];\n    const dys: Tensor[] = [];\n    node.outputs.forEach(o => {\n      const gradTensor =\n      tensorAccumulatedGradientMap[o.id];\n      if (gradTensor !== null) {\n        dys.push(gradTensor);\n      } else {\n        // This particular output is not in the back-propagation subgraph, so it\n        // does not affect the final output, thus\n        we put null for its dy.\n        dys.push(null);\n      }\n    });\n    if (node.gradient == null) {\n      throw new Error(\n        `Cannot compute gradient: gradient function not found` +\n        ` for ${node.kernelName}.`);\n    }\n    //\n    Backprop dy through this node and accumulate gradients over the inputs.\n    const inputGradients =\n    node.gradient(dys);\n    for (const inputName in node.inputs) {\n      if (!(inputName in inputGradients)) {\n        throw new Error(\n          `Cannot backprop through input ${inputName}.` +\n          ` Available gradients found:\n          ${Object.keys(inputGradients).}`);\n      }\n      // Call the gradient function.\n      const dx = tidy(() =>\n      inputGradients[inputName]());\n      if (dx.dtype !== 'float32') {\n        throw new Error(\n          `Error in gradient\n          for op ${\n            node.kernelName}. The gradient of input ` +\n          `${inputName} must have 'float32'\n          dtype, but has '${dx.dtype}'`);\n      }\n      const x = node.inputs[inputName];\n      if (!util.arraysEqual(dx.shape,\n      x.shape)) {\n        throw new Error(\n          `Error in gradient for op ${\n            node.kernelName}. The gradient\n          of input ` +\n          `${inputName} has shape ${dx.shape}, which does not match ` +\n          `the shape of the\n          input '${x.shape}'`);\n      }\n      if (tensorAccumulatedGradientMap[x.id] == null) {\n        tensorAccumulatedGradientMap[x.id] = dx;\n      } else {\n        const curGradient =\n        tensorAccumulatedGradientMap[x.id];\n        tensorAccumulatedGradientMap[x.id] = add(curGradient, dx);\n        curGradient.dispose();\n      }\n    }\n  }\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */

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*\\n\\nimport {DataType, TypedArray} from './types';\\nimport {computeStrides, isString, rightPad, sizeFromShape}
from './util';\\n\\n// Maximum number of values before we decide to show ellipsis.\\nconst
FORMAT_LIMIT_NUM_VALS = 20;\\n// Number of first and last values to show when displaying a, b,...,y,
z.\\nconst FORMAT_NUM_FIRST_LAST_VALS = 3;\\n// Number of significant digits to show.\\nconst
FORMAT_NUM_SIG_DIGITS = 7;\\n\\nexport function tensorToString(\\n  vals: TypedArray|string[], shape:
number[], dtype: DataType,\\n  verbose: boolean) {\\n  const strides = computeStrides(shape);\\n  const padPerCol =
computeMaxSizePerColumn(vals, shape, dtype, strides);\\n  const rank = shape.length;\\n  const valsLines =
subTensorToString(vals, shape, dtype, strides, padPerCol);\\n  const lines = ['Tensor'];\\n  if (verbose) {\\n
lines.push(` dtype: ${dtype}`);\\n  lines.push(` rank: ${rank}`);\\n  lines.push(` shape: [${shape}]`);\\n
lines.push(` values:`);\\n  }\\n  lines.push(valsLines.map(l => ` ` + l).join("\\n"));\\n  return
lines.join("\\n");\\n}\\n\\nfunction computeMaxSizePerColumn(\\n  vals: TypedArray|string[], shape: number[], dtype:
DataType,\\n  strides: number[]): number[] {\\n  const n = sizeFromShape(shape);\\n  const numCols =
strides[strides.length - 1];\\n  const padPerCol = new Array(numCols).fill(0);\\n  const rank = shape.length;\\n  const
valuesOrTuples = \\n    dtype === 'complex64' ? createComplexTuples(vals) : vals;\\n  \\n  if (rank > 1) {\\n    for (let
row = 0; row < n / numCols; row++) {\\n      const offset = row * numCols;\\n      for (let j = 0; j < numCols; j++) {\\n
        padPerCol[j] = Math.max(\\n          padPerCol[j],\\n          valToString(valuesOrTuples[offset + j], 0,
dtype).length);\\n      }\\n    }\\n  }\\n  return padPerCol;\\n}\\n\\nfunction valToString(\\n  val: number|string|[number,
number], pad: number, dtype: DataType) {\\n  let valStr: string;\\n  if (Array.isArray(val)) {\\n    valStr =
`${parseFloat(val[0].toFixed(FORMAT_NUM_SIG_DIGITS))} + ` + \\n
`${parseFloat(val[1].toFixed(FORMAT_NUM_SIG_DIGITS))}j`;\\n  } else if (isString(val)) {\\n    valStr =
`${val}`;\\n  } else if (dtype === 'bool') {\\n    valStr = boolNumToString(val);\\n  } else {\\n    valStr =
parseFloat(val.toFixed(FORMAT_NUM_SIG_DIGITS)).toString();\\n  }\\n  return rightPad(valStr,
pad);\\n}\\n\\nfunction boolNumToString(v: number): string {\\n  return v === 0 ? 'false' : 'true';\\n}\\n\\nfunction
subTensorToString(\\n  vals: TypedArray|string[], shape: number[], dtype: DataType,\\n  strides: number[],
padPerCol: number[], isLast = true): string[] {\\n  const storagePerElement = dtype === 'complex64' ? 2 : 1;\\n  \\n
const size = shape[0];\\n  const rank = shape.length;\\n  if (rank === 0) {\\n    if (dtype === 'complex64') {\\n      const
complexTuple = createComplexTuples(vals);\\n      return [valToString(complexTuple[0], 0, dtype)];\\n    }\\n    if
(dtype === 'bool') {\\n      return [boolNumToString(vals[0] as number)];\\n    }\\n    return [vals[0].toString()];\\n
  }\\n  \\n  if (rank === 1) {\\n    if (size > FORMAT_LIMIT_NUM_VALS) {\\n      const firstValsSize =
FORMAT_NUM_FIRST_LAST_VALS * storagePerElement;\\n      let firstVals =
Array.from<number|string|[number, number]>(\\n        vals.slice(0, firstValsSize));\\n      let lastVals =
Array.from<number|string|[number, number]>(vals.slice(\\n        (size - FORMAT_NUM_FIRST_LAST_VALS) *
storagePerElement,\\n        size * storagePerElement));\\n      if (dtype === 'complex64') {\\n        firstVals =
createComplexTuples(firstVals);\\n        lastVals = createComplexTuples(lastVals);\\n      }\\n      return [\\n        '[' + \\n
          firstVals.map((x, i) => valToString(x, padPerCol[i], dtype))\\n            .join(', ') + \\n          ', ..., ' + \\n
          lastVals\\n            .map(\\n              (x, i) => valToString(\\n                x, padPerCol[size -
FORMAT_NUM_FIRST_LAST_VALS + i], dtype))\\n            .join(', ') + \\n          ']'\\n        ];\\n      }\\n      const
displayVals: Array<number|string|[number, number]> = \\n        dtype === 'complex64' ? createComplexTuples(vals)
:\\n        Array.from<number|string>(vals);\\n      return [\\n        '[' + \\n          displayVals.map((x, i) =>
valToString(x, padPerCol[i], dtype))\\n            .join(', ') + \\n          ']'\\n        ];\\n      }\\n      // The array is rank 2 or more.\\n      const
subshape = shape.slice(1);\\n      const substrides = strides.slice(1);\\n      const stride = strides[0] * storagePerElement;\\n
      const lines: string[] = [];\\n      if (size > FORMAT_LIMIT_NUM_VALS) {\\n        for (let i = 0; i <
FORMAT_NUM_FIRST_LAST_VALS; i++) {\\n          const start = i * stride;\\n          const end = start + stride;\\n
          lines.push(...subTensorToString(\\n            vals.slice(start, end), subshape, dtype, substrides, padPerCol, \\n
            false /* isLast */));\\n        }\\n        lines.push('...');\\n        for (let i = size - FORMAT_NUM_FIRST_LAST_VALS; i < size; i++)
{\\n          const start = i * stride;\\n          const end = start + stride;\\n          lines.push(...subTensorToString(\\n
            vals.slice(start, end), subshape, dtype, substrides, padPerCol, \\n              i === size - 1 /* isLast */));\\n        }\\n      } else {\\n

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for (let i = 0; i < size; i++) {\n    const start = i * stride;\n    const end = start + stride;\n
lines.push(...subTensorToString(\n        vals.slice(start, end), subshape, dtype, substrides, padPerCol,\n        i ===\n
size - 1 /* isLast */));\n    }\n    }\n    const sep = rank === 2 ? ',': ',';\n    lines[0] = '[' + lines[0] + sep;\n    for (let i = 1; i <\n
lines.length - 1; i++) {\n        lines[i] = '' + lines[i] + sep;\n    }\n    let newLineSep = ',\n';\n    for (let i = 2; i < rank; i++)\n
{\n        newLineSep += '\n';\n    }\n    lines[lines.length - 1] =\n        '' + lines[lines.length - 1] + ']' + (isLast ? '\n\n':\n
newLineSep);\n    return lines;\n}\n\nfunction createComplexTuples(vals: Array<{\n
TypedArray): Array<[number, number]> {\n    const complexTuples: Array<[number, number]> = [];\n    for (let i = 0;\n
i < vals.length; i += 2) {\n        complexTuples.push([vals[i], vals[i + 1]] as [number, number]);\n    }\n    return\n
complexTuples;\n}\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under\n
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n
distributed under the License is distributed\n
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n
implied.\n * See the License for the specific language governing permissions and\n
limitations under the\n
License.\n *
=====
*\n\nimport {getGlobal} from './global_util';\nimport {tensorToString} from './tensor_format';\nimport {ArrayMap,\nBackendValues, DataType, DataTypeMap, DataValues, NumericDataType, Rank, ShapeMap, SingleValueMap,\nTypedArray} from './types';\nimport * as util from './util';\nimport {computeStrides, toNestedArray} from\n
'/util';\n\nexport interface TensorData<D extends DataType> {\n    dataId?: DataId;\n    values?:\n
DataTypeMap[D];\n}\n\n// This interface mimics KernelBackend (in backend.ts), which would create a\n
circular\n
dependency if imported.\n\nexport interface Backend {} \n\n/**\n * A mutable object, similar to `tf.Tensor`, that\n
allows users to set values\n
* at locations before converting to an immutable `tf.Tensor`.\n
*\n
* See `tf.buffer` for\n
creating a tensor buffer.\n
*\n
* @doc {heading: 'Tensors', subheading: 'Classes'}\n
*\n
\nexport class TensorBuffer<R\n
extends Rank, D extends DataType = 'float32'> {\n    size: number;\n    shape: ShapeMap[R];\n    strides: number[];\n    values: DataTypeMap[D];\n\n    constructor(shape: ShapeMap[R], public dtype: D, values?: DataTypeMap[D]) {\n        this.shape = shape.slice() as ShapeMap[R];\n        this.size = util.sizeFromShape(shape);\n\n        if (values != null) {\n            const n = values.length;\n            util.assert(\n                n === this.size,\n                () => `Length of values '${n}' does not\n
match the size ` +\n                `inferred by the shape '${this.shape}'.`);\n        }\n        if (dtype === 'complex64') {\n            throw\n
new Error(\n                `complex64 dtype TensorBuffers are not supported. Please create ` +\n                `a TensorBuffer for\n
the real and imaginary parts separately and ` +\n                `call tf.complex(real, imag).`);\n        }\n        this.values = values ||\n
util.getArrayFromDType(dtype, this.size);\n        this.strides = computeStrides(shape);\n    }\n\n    /**\n     * Sets a value in\n
the buffer at a given location.\n
     *\n
     * @param value The value to set.\n
     * @param locs The location indices.\n
     *\n
     * @doc {heading: 'Tensors', subheading: 'Creation'}\n
     *\n
     * set(value: SingleValueMap[D], ...locs: number[]):\n
void {\n        if (locs.length === 0) {\n            locs = [0];\n        }\n        util.assert(\n            locs.length === this.rank,\n            () =>\n
`The number of provided coordinates (${locs.length}) must ` +\n            `match the rank (${this.rank})`);\n\n        const\n
index = this.locToIndex(locs);\n        this.values[index] = value as number;\n    }\n\n    /**\n     * Returns the value in the\n
buffer at the provided location.\n
     *\n
     * @param locs The location indices.\n
     *\n
     * @doc {heading: 'Tensors',\n
subheading: 'Creation'}\n
     *\n
     * get(...locs: number[]): SingleValueMap[D] {\n        if (locs.length === 0) {\n            locs =\n
[0];\n        }\n        let i = 0;\n        for (const loc of locs) {\n            if (loc < 0 || loc >= this.shape[i]) {\n                const msg =\n
`Requested out of range element at ${locs}. ` +\n                ` Buffer shape=${this.shape}`;\n                throw new\n
Error(msg);\n            }\n            i++;\n        }\n        let index = locs[locs.length - 1];\n        for (let i = 0; i < locs.length - 1; ++i) {\n            index +=\n
this.strides[i] * locs[i];\n        }\n        return this.values[index] as SingleValueMap[D];\n    }\n\n    locToIndex(locs: number[]): number {\n        if (this.rank === 0) {\n            return 0;\n        } else if (this.rank === 1) {\n            return locs[0];\n        }\n        let index = locs[locs.length - 1];\n        for (let i = 0; i < locs.length - 1; ++i) {\n            index +=\n
this.strides[i] * locs[i];\n        }\n        return index;\n    }\n\n    indexToLoc(index: number): number[] {\n        if (this.rank ===\n
0) {\n            return [];\n        } else if (this.rank === 1) {\n            return [index];\n        }\n        const locs: number[] = new\n
Array(this.shape.length);\n        for (let i = 0; i < locs.length - 1; ++i) {\n            locs[i] = Math.floor(index /

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this.strides[i]);\n    index -= locs[i] * this.strides[i];\n    }\n    locs[locs.length - 1] = index;\n    return locs;\n  }\n\n  get rank() {\n    return this.shape.length;\n  }\n\n  /**\n   * Creates an immutable `tf.Tensor` object from the buffer.\n   *\n   * @doc {heading: 'Tensors', subheading: 'Creation'}\n   */\n  toTensor(): Tensor<R> {\n    return\n      trackerFn().makeTensor(this.values, this.shape, this.dtype) as\n        Tensor<R>;\n  }\n\n  export interface\n    TensorTracker {\n    makeTensor(\n      values: DataValues, shape: number[], dtype: DataType,\n      backend?:\n        Backend): Tensor;\n    makeVariable(\n      initialValue: Tensor, trainable?: boolean, name?: string,\n      dtype?:\n        DataType): Variable;\n    incRef(a: Tensor, backend: Backend): void;\n    disposeTensor(t: Tensor): void;\n    disposeVariable(v: Variable): void;\n    read(dataId: DataId): Promise<BackendValues>;\n    readSync(dataId: DataId):\n      BackendValues;\n  }\n\n  /**\n   * The Tensor class calls into this handler to delegate chaining operations.\n   */\n  export interface OpHandler {\n    cast<T extends Tensor>(x: T, dtype: DataType): T;\n    buffer<R extends Rank, D extends\n      DataType>(\n      shape: ShapeMap[R], dtype: D,\n      values?: DataTypeMap[D]): TensorBuffer<R, D>;\n    print<T\n      extends Tensor>(x: T, verbose: boolean): void;\n    clone<T extends Tensor>(x: T): T;\n    // TODO(yassogba) bring\n    reshape back?\n  }\n\n  // For tracking tensor creation and disposal.\n  let trackerFn: () => TensorTracker = null;\n\n  // Used by chaining methods to call into ops.\n  let opHandler: OpHandler = null;\n\n  // Used to warn about deprecated\n  methods.\n  let deprecationWarningFn: (msg: string) => void = null;\n\n  // This here so that we can use this method on\n  dev branches and keep the\n  // functionality at master.\n  // tslint:disable-next-line:no-unused-\n  expression\n  [deprecationWarningFn];\n\n  /**\n   * An external consumer can register itself as the tensor tracker. This\n   way\n   * the Tensor class can notify the tracker for every tensor created and\n   * disposed.\n   */\n  export function\n    setTensorTracker(fn: () => TensorTracker) {\n    trackerFn = fn;\n  }\n\n  /**\n   * An external consumer can register\n   itself as the op handler. This way the\n   * Tensor class can have chaining methods that call into ops via the op\n   * handler.\n   */\n  export function setOpHandler(handler: OpHandler) {\n    opHandler = handler;\n  }\n\n  /**\n   * Sets the\n  deprecation warning function to be used by this file. This way the\n   * Tensor class can be a leaf but still use the\n  environment.\n   */\n  export function setDeprecationWarningFn(fn: (msg: string) => void) {\n    deprecationWarningFn = fn;\n  }\n\n  /**\n   * We wrap data id since we use weak map to avoid memory leaks.\n   * Since we have our own\n  memory management, we have a reference counter\n   * mapping a tensor to its data, so there is always a pointer\n  (even if that\n   * data is otherwise garbage collectable).\n   * See https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global\_Objects/WeakMap\n   */\n  export type DataId = object; // object\n  instead of {} to force non-primitive.\n\n  // Declare this namespace to make Tensor class augmentation work in\n  google3.\n  export declare namespace Tensor {\n\n    /**\n     * A `tf.Tensor` object represents an immutable,\n     multidimensional array of\n     * numbers that has a shape and a data type.\n     *\n     * See `tf.tensor` for details on how to\n     create a `tf.Tensor`.\n     *\n     * @doc {heading: 'Tensors', subheading: 'Classes'}\n     */\n    export class Tensor<R extends\n      Rank = Rank> {\n      /**\n       * Unique id of this tensor.\n       */\n      readonly id: number;\n      /**\n       * Id of the bucket holding the\n       data for this tensor. Multiple arrays can\n       * point to the same bucket (e.g. when calling array.reshape()).\n       */\n      dataId: DataId;\n      /**\n       * The shape of the tensor.\n       */\n      readonly shape: ShapeMap[R];\n      /**\n       * Number of elements in the\n       tensor.\n       */\n      readonly size: number;\n      /**\n       * The data type for the array.\n       */\n      readonly dtype: DataType;\n      /**\n       * The\n       rank type for the array (see `Rank` enum).\n       */\n      readonly rankType: R;\n\n      /**\n       * Whether this tensor has been\n       globally kept.\n       */\n      kept = false;\n      /**\n       * The id of the scope this tensor is being tracked in.\n       */\n      scopeId: number;\n\n      /**\n       * Number of elements to skip in each dimension when indexing. See\n       *\n       https://docs.scipy.org/doc/numpy/reference/generated/numpy.ndarray.strides.html\n       */\n      readonly strides:\n        number[];\n\n      constructor(shape: ShapeMap[R], dtype: DataType, dataId: DataId, id: number) {\n        this.shape =\n          shape.slice() as ShapeMap[R];\n        this.dtype = dtype || 'float32';\n        this.size = util.sizeFromShape(shape);\n        this.strides = computeStrides(shape);\n        this.dataId = dataId;\n        this.id = id;\n        this.rankType = (this.rank < 5 ?\n          this.rank.toString() : 'higher') as R;\n      }\n\n      get rank(): number {\n        return this.shape.length;\n      }\n\n      /**\n       * Returns a promise of `tf.TensorBuffer` that holds the underlying data.\n       *\n       * @doc {heading: 'Tensors',\n        subheading: 'Classes'}\n       */\n      async buffer<D extends DataType = 'float32'>(): Promise<TensorBuffer<R, D>> {\n        const vals = await this.data<D>();\n        return opHandler.buffer(this.shape, this.dtype as D, vals);\n      }\n\n      /**\n       * Returns a `tf.TensorBuffer` that holds the underlying data.\n       *\n       * @doc {heading: 'Tensors', subheading: 'Classes'}\n       */\n      bufferSync<D extends DataType = 'float32'>(): TensorBuffer<R, D> {\n        return opHandler.buffer(this.shape,

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this.dtype as D, this.dataSync());\n }\n\n /**\n * Returns the tensor data as a nested array. The transfer of data is
done\n * asynchronously.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n async array():
Promise<ArrayMap[R]> {\n  const vals = await this.data();\n  return toNestedArray(this.shape, vals) as
ArrayMap[R];\n }\n\n /**\n * Returns the tensor data as a nested array. The transfer of data is done\n *
synchronously.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n arraySync(): ArrayMap[R] {\n
return toNestedArray(this.shape, this.dataSync()) as ArrayMap[R];\n }\n\n /**\n * Asynchronously downloads the
values from the `tf.Tensor`. Returns a\n * promise of `TypedArray` that resolves when the computation has
finished.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n async data<D extends DataType =
NumericDataType>(): Promise<DataTypeMap[D]> {\n  this.throwIfDisposed();\n  const data =
trackerFn().read(this.dataId);\n  if (this.dtype === 'string') {\n    const bytes = await data as Uint8Array[];\n    try
{\n      return bytes.map(b => util.decodeString(b)) as DataTypeMap[D];\n    } catch {\n      throw new Error(\n
Failed to decode the string bytes into utf-8. ' +\n      'To get the original bytes, call tensor.bytes().');\n    }\n  }\n  return data as Promise<DataTypeMap[D]>;\n }\n\n /**\n * Synchronously downloads the values from the
`tf.Tensor`. This blocks the\n * UI thread until the values are ready, which can cause performance issues.\n *\n *
@doc {heading: 'Tensors', subheading: 'Classes'}\n */\n dataSync<D extends DataType = NumericDataType>():
DataTypeMap[D] {\n  this.throwIfDisposed();\n  const data = trackerFn().readSync(this.dataId);\n  if (this.dtype
=== 'string') {\n    try {\n      return (data as Uint8Array[]).map(b => util.decodeString(b)) as\n
DataTypeMap[D];\n    } catch {\n      throw new Error(\n      Failed to decode the string bytes into utf-8. ' +\n
      'To get the original bytes, call tensor.bytes().');\n    }\n  }\n  return data as DataTypeMap[D];\n }\n\n /**
Returns the underlying bytes of the tensor's data. */\n async bytes(): Promise<Uint8Array[]|Uint8Array> {\n
this.throwIfDisposed();\n  const data = await trackerFn().read(this.dataId);\n  if (this.dtype === 'string') {\n
return data as Uint8Array[];\n  } else {\n    return new Uint8Array((data as TypedArray).buffer);\n  }\n }\n\n /**\n * Disposes `tf.Tensor` from memory.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n
dispose(): void {\n  if (this.isDisposed) {\n    return;\n  }\n  trackerFn().disposeTensor(this);\n  this.isDisposedInternal = true;\n }\n\n protected isDisposedInternal = false;\n get isDisposed(): boolean {\n
return this.isDisposedInternal;\n }\n\n throwIfDisposed() {\n  if (this.isDisposed) {\n    throw new Error(`Tensor
is disposed.`);\n  }\n }\n\n /**\n * Prints the `tf.Tensor`. See `tf.print` for details.\n *\n * @param verbose
Whether to print verbose information about the tensor,\n * including dtype and size.\n *\n * @doc {heading:
'Tensors', subheading: 'Classes'}\n */\n print(verbose = false): void {\n  return opHandler.print(this, verbose);\n
}\n\n /**\n * Returns a copy of the tensor. See `tf.clone` for details.\n *\n * @doc {heading: 'Tensors', subheading:
'Classes'}\n */\n clone<T extends Tensor>(this: T): T {\n  this.throwIfDisposed();\n  return
opHandler.clone(this);\n }\n\n /**\n * Returns a human-readable description of the tensor. Useful for logging.\n
*\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n toString(verbose = false): string {\n  const vals =
this.dataSync();\n  return tensorToString(vals, this.shape, this.dtype, verbose);\n }\n\n cast<T extends this>(dtype:
DataType): T {\n  this.throwIfDisposed();\n  return opHandler.cast(this as T, dtype);\n }\n  variable(trainable =
true, name?: string, dtype?: DataType): Variable<R> {\n  this.throwIfDisposed();\n  return
trackerFn().makeVariable(this, trainable, name, dtype) as\n    Variable<R>;\n
}\n\n Object.defineProperty(Tensor, Symbol.hasInstance, {\n  value: (instance: Tensor) => {\n    // Implementation
note: we should use properties of the object that will be\n    // defined before the constructor body has finished
executing (methods).\n    // This is because when this code is transpiled by babel, babel will call\n    //
classCallCheck before the constructor body is run.\n    // See https://github.com/tensorflow/tfjs/issues/3384 for
backstory.\n    return !!instance && instance.data != null && instance.dataSync != null &&\n
instance.throwIfDisposed != null;\n  }\n});\n\n export function getGlobalTensorClass() {\n  // Use getGlobal so that
we can augment the Tensor class across package\n  // boundaries because the node resolution alg may result in
different modules\n  // being returned for this file depending on the path they are loaded from.\n  return
getGlobal('Tensor', () => {\n    return Tensor;\n  });\n }\n\n // Global side effect. Cache global reference to Tensor
class\n getGlobalTensorClass();\n\n export interface NumericTensor<R extends Rank = Rank> extends Tensor<R>
{\n  dtype: NumericDataType;\n  dataSync<D extends DataType = NumericDataType>(): DataTypeMap[D];\n
}

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data<D extends DataType = NumericDataType>(): Promise<DataTypeMap[D]>;\n\n\nexport interface
StringTensor<R extends Rank = Rank> extends Tensor<R> {\n  dtype: 'string';\n  dataSync<D extends DataType =
'string'>(): DataTypeMap[D];\n  data<D extends DataType = 'string'>(): Promise<DataTypeMap[D]>;\n\n\n/**
@doctest Tensor */\nexport type Scalar = Tensor<Rank.R0>;\n/** @doctest Tensor */\nexport type Tensor1D =
Tensor<Rank.R1>;\n/** @doctest Tensor */\nexport type Tensor2D = Tensor<Rank.R2>;\n/** @doctest Tensor
*/\nexport type Tensor3D = Tensor<Rank.R3>;\n/** @doctest Tensor */\nexport type Tensor4D =
Tensor<Rank.R4>;\n/** @doctest Tensor */\nexport type Tensor5D = Tensor<Rank.R5>;\n/** @doctest Tensor
*/\nexport type Tensor6D = Tensor<Rank.R6>;\n\n\n * A mutable `tf.Tensor`, useful for persisting state, e.g. for
training.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n * \nexport class Variable<R extends Rank =
Rank> extends Tensor<R> {\n  name: string;\n\n  constructor(\n    initialValue: Tensor<R>, public trainable:
boolean, name: string,\n    tensorId: number) {\n    super(\n      initialValue.shape, initialValue.dtype,
initialValue.dataId, tensorId);\n    this.name = name;\n  }\n\n  /**\n   * Assign a new `tf.Tensor` to this variable. The
new `tf.Tensor` must have\n   * the same shape and dtype as the old `tf.Tensor`.\n   * @param newValue New
tensor to be assigned to this variable.\n   * @doc {heading: 'Tensors', subheading: 'Classes'}\n   * \n
assign(newValue: Tensor<R>): void {\n    if (newValue.dtype !== this.dtype) {\n      throw new Error(\n
`dtype of the new value (${newValue.dtype}) and ` +\n      `previous value (${this.dtype}) must match`);\n    }\n
if (!util.arraysEqual(newValue.shape, this.shape)) {\n      throw new Error(\n      `shape of the new value
(${newValue.shape}) and ` +\n      `previous value (${this.shape}) must match`);\n    }\n
trackerFn().disposeTensor(this);\n    this.dataId = newValue.dataId;\n    trackerFn().incRef(this, null /* backend
*/);\n  }\n\n  dispose(): void {\n    trackerFn().disposeVariable(this);\n    this.isDisposedInternal = true;\n
}\n\n\nObject.defineProperty(Variable, Symbol.hasInstance, {\n  value: (instance: Variable) => {\n    return
instance instanceof Tensor && instance.assign != null &&\n    instance.assign instanceof Function;\n  }\n});\n\n", /**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\n/** @doctest number[] */\nexport interface ShapeMap {\n  R0: number[];\n  R1: [number];\n  R2: [number,
number];\n  R3: [number, number, number];\n  R4: [number, number, number, number];\n  R5: [number, number,
number, number, number];\n  R6: [number, number, number, number, number, number];\n}\n\n/** @doctest
number[] */\nexport interface ArrayMap {\n  R0: number;\n  R1: number[];\n  R2: number[][];\n  R3:
number[][][];\n  R4: number[][][][];\n  R5: number[][][][][];\n  R6: number[][][][][];\n}\n\n\nexport interface
DataTypeMap {\n  float32: Float32Array;\n  int32: Int32Array;\n  bool: Uint8Array;\n  complex64: Float32Array;\n
string: string[];\n}\n\n\nexport interface SingleValueMap {\n  bool: boolean;\n  int32: number;\n  float32: number;\n
complex64: number;\n  string: string;\n}\n\n\n/** @doctest 'float32'|'int32'|'bool'|'complex64'|'string' */\nexport type
DataType = keyof DataTypeMap;\nexport type NumericDataType = 'float32'|'int32'|'bool'|'complex64';\nexport type
TypedArray = Float32Array|Int32Array|Uint8Array;\n\n\n/** Tensor data used in tensor creation and user-facing API.
*/\nexport type DataValues = DataTypeMap[DataType];\n\n\n/** The underlying tensor data that gets stored in a
backend. */\nexport type BackendValues = Float32Array|Int32Array|Uint8Array|Uint8Array[];\n\n\nexport enum
Rank {\n  R0 = 'R0',\n  R1 = 'R1',\n  R2 = 'R2',\n  R3 = 'R3',\n  R4 = 'R4',\n  R5 = 'R5',\n  R6 = 'R6'\n}\n\n\nexport
type FlatVector = boolean[]|number[]|TypedArray;\nexport type RegularArray<T> =\n
T[]|T[][]|T[][][]|T[][][][]|T[][][][][]|T[][][][][];\n\n\n// tslint:disable-next-line:no-any\nexport interface
RecursiveArray<T extends any> {\n  [index: number]: T|RecursiveArray<T>;\n}\n\n\n// Looks for upcasting types.
Used, for example, in operations with mixed dtype\n// inputs.\nenum UpcastInt32AndMap {\n  'float32' = 'float32',\n
'int32' = 'int32',\n  'bool' = 'int32',\n  'complex64' = 'complex64'\n}\n\n\nenum UpcastBoolAndMap {\n  'float32' =
'float32',\n  'int32' = 'int32',\n  'bool' = 'bool',\n  'complex64' = 'complex64'\n}\n\n\nenum UpcastFloat32AndMap {\n

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'float32' = 'float32',\n 'int32' = 'float32',\n 'bool' = 'float32',\n 'complex64' = 'complex64'\n}\n\nenum
UpcastComplex64AndMap {\n 'float32' = 'complex64',\n 'int32' = 'complex64',\n 'bool' = 'complex64',\n
'complex64' = 'complex64'\n}\n\nconst upcastTypeMap = {\n 'float32': UpcastFloat32AndMap,\n 'int32':
UpcastInt32AndMap,\n 'bool': UpcastBoolAndMap,\n 'complex64': UpcastComplex64AndMap\n};\n\n\nexport
function upcastType(typeA: DataType, typeB: DataType): DataType {\n if (typeA === 'string' || typeB === 'string')
{\n if (typeA === 'string' && typeB === 'string') {\n return 'string';\n }\n throw new Error(`Can not upcast
${typeA} with ${typeB}`);\n }\n return upcastTypeMap[typeA][typeB];\n}\n\n/** Returns the output type after
summation. */\n\nexport function sumOutType(type: DataType): DataType {\n return upcastType(type,
'int32');\n}\n\n/** @docalias TypedArray|Array */\n\nexport type TensorLike =\n
TypedArray|number|boolean|string|RecursiveArray<number|number[]|TypedArray>|\n
RecursiveArray<boolean>|RecursiveArray<string>|Uint8Array[];\n\nexport type ScalarLike =
number|boolean|string|Uint8Array;\n\n/** @docalias TypedArray|Array */\n\nexport type TensorLike1D =
TypedArray|number[]|boolean[]|string[]|Uint8Array[];\n\n/** @docalias TypedArray|Array */\n\nexport type
TensorLike2D = TypedArray|number[]|number[]|boolean[]|boolean[][]|\n
string[]|string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport type
TensorLike3D = TypedArray|number[]|number[][]|boolean[]|\n
boolean[][]|string[]|string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport
type TensorLike4D = TypedArray|number[]|number[][]|boolean[]|\n
boolean[][]|string[]|string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport
type TensorLike5D =\n TypedArray|number[]|number[][]|boolean[]|boolean[][]|string[]|\n
string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport type TensorLike6D
=\n TypedArray|number[]|number[][]|boolean[]|boolean[][]|\n
string[]|string[][]|Uint8Array[]|Uint8Array[][];\n\n/** Type for representing image data in Uint8Array
type. */\n\nexport interface PixelData {\n width: number;\n height: number;\n data: Uint8Array;\n}\n\n"/**\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */\n
=====\n
*/\n\nimport {Tensor} from './tensor';\nimport {TensorContainer, TensorContainerArray} from
'./tensor_types';\nimport {upcastType} from './types';\nimport {assert} from './util';\n\nexport function
makeTypesMatch<T extends Tensor>(a: T, b: T): [T, T] {\n if (a.dtype === b.dtype) {\n return [a, b];\n }\n
const dtype = upcastType(a.dtype, b.dtype);\n return [a.cast(dtype), b.cast(dtype)];\n}\n\n\nexport function
assertTypesMatch(a: Tensor, b: Tensor): void {\n assert(\n a.dtype === b.dtype,\n () => `The dtypes of the
first(${a.dtype}) and` +\n `second(${b.dtype}) input must match`);\n}\n\n\nexport function
isTensorInList(tensor: Tensor, tensorList: Tensor[]): boolean {\n return tensorList.some(x => x.id ===
tensor.id);\n}\n\n/**\n * Extracts any `Tensor`s found within the provided object.\n * @param container an
object that may be a `Tensor` or may directly contain\n * `Tensor`s, such as a `Tensor[]` or `{key: Tensor, ...}`. In
general it\n * is safe to pass any object here, except that `Promise`s are not\n * supported.\n * @returns An array
of `Tensors` found within the passed object. If the\n * argument is simply a `Tensor`, a list containing that `Tensor`
is\n * returned. If the object is not a `Tensor` or does not\n * contain `Tensors`, an empty list is returned.\n
*/\n\nexport function getTensorsInContainer(result: TensorContainer): Tensor[] {\n const list: Tensor[] = [];\n
const seen = new Set<{}|void>();\n walkTensorContainer(result, list, seen);\n return list;\n}\n\n\nfunction
walkTensorContainer(\n container: TensorContainer, list: Tensor[], seen: Set<{}|void>): void {\n if (container ===
null) {\n return;\n }\n if (container instanceof Tensor) {\n list.push(container);\n return;\n }\n if
(!isIterable(container)) {\n return;\n }\n // Iteration over keys works also for arrays.\n const iterable = container

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as TensorContainerArray;\n for (const k in iterable) {\n  const val = iterable[k];\n  if (!seen.has(val)) {\n    seen.add(val);\n    walkTensorContainer(val, list, seen);\n  }\n }\n}\n\n// tslint:disable-next-line:no-any\nfunction\nisIterable(obj: any): boolean {\n  return Array.isArray(obj) || typeof obj === 'object';\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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*\n\nimport {BackendTimingInfo, DataMover, KernelBackend} from './backends/backend';\nimport {Environment, setEnvironmentGlobal} from './environment';\nimport {getGlobalNamespace} from './global_util';\nimport {Add, Cast, Identity} from './kernel_names';\nimport {getGradient, getKernel, getKernelsForBackend, GradFunc, NamedAttrMap, TensorInfo} from './kernel_registry';\nimport {KernelProfile, Profiler} from './profiler';\nimport {backpropagateGradients, getFilteredNodesXToY, TapeNode} from './tape';\nimport {DataId, setTensorTracker, Tensor, TensorTracker, Variable} from './tensor';\nimport {GradSaveFunc, NamedTensorMap, NamedVariableMap, TensorContainer} from './tensor_types';\nimport {getTensorsInContainer} from './tensor_util';\nimport {BackendValues, DataType, DataValues} from './types';\nimport * as util from './util';\nimport {bytesFromStringArray, makeOnesTypedArray, now, sizeFromShape} from './util';\n\n/**\n * A function that computes an output. The save function is for saving tensors\n * computed in the forward pass, that we need in the backward pass.\n */\nexport type ForwardFunc<T> = (backend: KernelBackend, save?: GradSaveFunc) => T;\n\n/**\n * @docalias (a: Tensor, b: Tensor, ..., save?: Function) => {\n *   value: Tensor,\n *   gradFunc: (dy: Tensor, saved?: NamedTensorMap) => Tensor | Tensor[]\n * }\n */\nexport type CustomGradientFunc<T extends Tensor> =\n  (...inputs: Array<Tensor|GradSaveFunc>) => {\n    value: T;\n    gradFunc: (dy: T, saved: Tensor[]) => Tensor | Tensor[];\n  };\n\nexport type MemoryInfo = {\n  numTensors: number;\n  numDataBuffers: number;\n  numBytes: number;\n  unreliable?: boolean;\n  reasons: string[];\n};\n\nexport type KernelInfo = {\n  name: string;\n  bytesAdded: number;\n  totalBytesSnapshot: number;\n  tensorsAdded: number;\n  totalTensorsSnapshot: number;\n  inputShapes: number[][];\n  outputShapes: number[][];\n  kernelTimeMs: number | {error: string} | Promise<number|{error: string}>;\n  extraInfo: string | Promise<string>;\n};\n\nexport type ProfileInfo = {\n  newBytes: number;\n  newTensors: number;\n  peakBytes: number;\n  kernels: KernelInfo[];\n  result: TensorContainer;\n  kernelNames: string[];\n};\n\nexport interface TimingInfo extends BackendTimingInfo {\n  wallMs: number;\n}\n\n/**\n * @docalias Function\n */\nexport type ScopeFn<T extends TensorContainer> = () => T;\n\ninterface ScopeState {\n  track: Tensor[];\n  name: string;\n  id: number;\n}\n\ninterface RegisteredKernelInvocation<I extends NamedTensorMap> {\n  kernelName: string;\n  inputs: I;\n  attrs?: NamedAttrMap;\n}\n\ninterface CustomGradKernelInvocation<T extends Tensor|Tensor[], I extends NamedTensorMap> {\n  forwardFunc: ForwardFunc<T>;\n  backwardsFunc: (dy: T, saved: Tensor[]) => {\n    [P in keyof I]: () => I[P]\n  }; \n  inputs: I;\n  attrs?: NamedAttrMap;\n}\n\nfunction isRegisteredKernelInvocation<T extends Tensor|Tensor[], I extends NamedTensorMap>(\n  kernelInvocation: RegisteredKernelInvocation<I> | CustomGradKernelInvocation<T, I>):\n  kernelInvocation is RegisteredKernelInvocation<I> {\n  return (kernelInvocation as RegisteredKernelInvocation<I>).kernelName != null;\n}\n\nexport class EngineState {\n  // Public since optimizers will use it.\n  registeredVariables: NamedVariableMap = {};\n  nextTapeNodeId = 0;\n  numBytes = 0;\n  numTensors = 0;\n  numStringTensors = 0;\n  numDataBuffers = 0;\n  activeTape: TapeNode[];\n  // Number of nested tf.grad() statements when computing higher-order\n  // gradients. E.g. `1` for first-order gradients and `2` for second-order\n  // gradients. Used to track if the tape should be removed after a backprop.\n  gradientDepth = 0;\n  // Number of nested kernel calls. When kernel depth is greater than 1, we turn\n  // off the tape.\n  kernelDepth = 0;\n  // Keep Tensors that parallel the tapes.\n  activeScope: ScopeState;\n  scopeStack: ScopeState[] = [];\n  /**\n   * Keeps track of the number of data moves during a kernel execution. We\n   * maintain a stack since kernels can call other

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kernels, recursively.\n */\n numDataMovesStack: number[] = [];\n nextScopeId = 0;\n\n tensorInfo = new
WeakMap<DataId, {\n  backend: KernelBackend,\n  bytes: number,\n  dtype: DataType,\n  shape: number[]\n
}>);\n\n profiling = false;\n activeProfile: ProfileInfo = {\n  newBytes: 0,\n  newTensors: 0,\n  peakBytes: 0,\n
kernels: [],\n  result: null,\n  get kernelNames():\n    string[] {\n      return Array.from(new
Set(this.kernels.map(k => k.name));\n    }\n  };\n\n dispose() {\n  for (const variableName in
this.registeredVariables) {\n    this.registeredVariables[variableName].dispose();\n  }\n}\n\n\nexport class
Engine implements TensorTracker, DataMover {\n  state: EngineState;\n  backendName: string;\n  registry: {[id:
string]: KernelBackend} = {};\n  registryFactory: {\n    [id: string]: {\n      factory: () => KernelBackend |
Promise<KernelBackend>,\n      priority: number\n    }\n  } = {};\n  private profiler: Profiler;\n  private
backendInstance: KernelBackend;\n  private pendingBackendInit: Promise<boolean>;\n  private
pendingBackendInitId = 0;\n  constructor(public ENV: Environment) {\n    this.state = new EngineState();\n  }\n\n
async ready(): Promise<void> {\n  if (this.pendingBackendInit != null) {\n    return
this.pendingBackendInit.then(() => {});\n  }\n  if (this.backendInstance != null) {\n    return;\n  }\n  const
sortedBackends = this.getSortedBackends();\n  for (let i = 0; i < sortedBackends.length; i++) {\n    const
backendName = sortedBackends[i];\n    const success = await this.initializeBackend(backendName).success;\n
if (success) {\n      await this.setBackend(backendName);\n      return;\n    }\n  }\n  throw new Error(\n
`Could not initialize any backends, all backend initializations ` +\n    `failed.`);\n}\n\n  get backend():
KernelBackend {\n  if (this.pendingBackendInit != null) {\n    throw new Error(\n      `Backend
'${this.backendName}' has not yet been initialized. Make ` +\n      `sure to await tf.ready() or await
tf.setBackend() before calling ` +\n      `other methods`);\n  }\n  if (this.backendInstance == null) {\n    const
{name, asyncInit} = this.initializeBackendsAndReturnBest();\n    if (asyncInit) {\n      throw new Error(\n
`The highest priority backend '${name}' has not yet been ` +\n      `initialized. Make sure to await tf.ready() or `
+\n      `await tf.setBackend() before calling other methods`);\n    }\n    this.setBackend(name);\n  }\n  return
this.backendInstance;\n}\n\n  backendNames(): string[] {\n  return Object.keys(this.registryFactory);\n}\n\n
findBackend(backendName: string): KernelBackend {\n  if (!(backendName in this.registry)) {\n    // If the
backend hasn't been initialized but we have a registry entry for\n    // it, initialize it and return it.\n    if
(backendName in this.registryFactory) {\n      const {asyncInit} = this.initializeBackend(backendName);\n      if
(asyncInit) {\n        // Backend is not ready yet.\n        return null;\n      }\n    } else {\n      return null;\n    }\n  }\n  return this.registry[backendName];\n}\n\n  findBackendFactory(backendName: string):\n    () =>
KernelBackend | Promise<KernelBackend> {\n  if (!(backendName in this.registryFactory)) {\n    return null;\n  }\n  return this.registryFactory[backendName].factory;\n}\n\n  registerBackend(\n    backendName: string,\n    factory: () => KernelBackend | Promise<KernelBackend>,\n    priority = 1): boolean {\n  if (backendName in
this.registryFactory) {\n    console.warn(\n      `${backendName} backend was already registered. ` +\n     
`Reusing existing backend factory.`);\n    return false;\n  }\n  this.registryFactory[backendName] = {factory,
priority};\n  return true;\n}\n\n  async setBackend(backendName: string): Promise<boolean> {\n  if
(this.registryFactory[backendName] == null) {\n    throw new Error(`Backend name '${backendName}' not found
in registry`);\n  }\n  this.backendName = backendName;\n  if (this.registry[backendName] == null) {\n    this.backendInstance = null;\n    const {success, asyncInit} = this.initializeBackend(backendName);\n    const
result = asyncInit ? await success : success;\n    if (!result) {\n      return false;\n    }\n  }\n  this.backendInstance = this.registry[backendName];\n  this.setupRegisteredKernels();\n  // Reset the profiler.\n  this.profiler = new Profiler(this.backendInstance);\n\n  return true;\n}\n\n  private setupRegisteredKernels(): void {\n  const kernels = getKernelsForBackend(this.backendName);\n  kernels.forEach(kernel => {\n    if
(kernel.setupFunc != null) {\n      kernel.setupFunc(this.backendInstance);\n    }\n  });\n}\n\n  private
disposeRegisteredKernels(backendName: string): void {\n  const kernels =
getKernelsForBackend(backendName);\n  kernels.forEach(kernel => {\n    if (kernel.disposeFunc != null) {\n      kernel.disposeFunc(this.registry[backendName]);\n    }\n  });\n}\n\n  /**\n   * Initializes a backend by looking
up the backend name in the factory\n   * registry and calling the factory method. Returns a boolean representing\n   * whether the initialization of the backend succeeded. Throws an error if\n   * there is no backend in the factory

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registry.\n */\n private initializeBackend(backendName: string):\n     { success: boolean|Promise<boolean>,\n     asyncInit: boolean } {\n     const registryFactoryEntry = this.registryFactory[backendName];\n     if\n     (registryFactoryEntry == null) {\n     throw new Error(\n         `Cannot initialize backend ${backendName}, no\n     registration found.`);\n     }\n     try {\n     const backend = registryFactoryEntry.factory();\n     /* Test if the\n     factory returns a promise.\n     Done in a more liberal way than\n     previous\n     'Promise.resolve(backend)===backend'\n     as we needed to account for custom Promise\n     implementations\n     (e.g. Angular) */\n     if (backend && !(backend instanceof KernelBackend) &&\n         typeof backend.then ===\n     'function') {\n     const promiseId = ++this.pendingBackendInitId;\n     const success =\n     backend\n     .then(backendInstance => {\n     // Outdated promise. Another backend was set in the meantime.\n     if (promiseId < this.pendingBackendInitId) {\n     return false;\n     }\n     this.registry[backendName] = backendInstance;\n     this.pendingBackendInit = null;\n     return\n     true;\n     })\n     .catch(err => {\n     // Outdated promise. Another backend was set in the\n     meantime.\n     if (promiseId < this.pendingBackendInitId) {\n     return false;\n     }\n     this.pendingBackendInit = null;\n     console.warn(\n         `Initialization of backend\n     ${backendName} failed`);\n     console.warn(err.stack || err.message);\n     return false;\n     });\n     this.pendingBackendInit = success;\n     return { success, asyncInit: true }; }\n     } else {\n     this.registry[backendName] = backend as KernelBackend;\n     return { success: true, asyncInit: false }; }\n     }\n     catch (err) {\n     console.warn(`Initialization of backend ${backendName} failed`);\n     console.warn(err.stack ||\n     err.message);\n     return { success: false, asyncInit: false }; }\n     }\n     }\n     removeBackend(backendName: string):\n     void {\n     if (!(backendName in this.registryFactory)) {\n     throw new Error(`${backendName} backend not found\n     in registry`);\n     }\n     if (this.backendName === backendName && this.pendingBackendInit != null) {\n     //\n     There is a pending promise of the backend we want to remove. Make it\n     // obsolete.\n     this.pendingBackendInitId++;\n     }\n     if (backendName in this.registry) {\n     this.disposeRegisteredKernels(backendName);\n     this.registry[backendName].dispose();\n     delete\n     this.registry[backendName];\n     }\n     delete this.registryFactory[backendName];\n     // Unset the backend if it is\n     active.\n     if (this.backendName === backendName) {\n     this.pendingBackendInit = null;\n     this.backendName\n     = null;\n     this.backendInstance = null;\n     }\n     }\n     private getSortedBackends(): string[] {\n     if\n     (Object.keys(this.registryFactory).length === 0) {\n     throw new Error('No backend found in registry.);\n     }\n     return Object.keys(this.registryFactory).sort((a: string, b: string) => {\n     // Highest priority comes first.\n     return\n     this.registryFactory[b].priority -\n     this.registryFactory[a].priority;\n     });\n     }\n     private\n     initializeBackendsAndReturnBest():\n     { name: string, asyncInit: boolean } {\n     const sortedBackends =\n     this.getSortedBackends();\n     for (let i = 0; i < sortedBackends.length; i++) {\n     const backendName =\n     sortedBackends[i];\n     const { success, asyncInit } = this.initializeBackend(backendName);\n     if (asyncInit ||\n     success) {\n     return { name: backendName, asyncInit }; }\n     }\n     throw new Error(\n     `Could not\n     initialize any backends, all backend initializations` +\n     ` failed.`);\n     }\n     moveData(backend: KernelBackend,\n     dataId: DataId) {\n     const info = this.state.tensorInfo.get(dataId);\n     const srcBackend = info.backend;\n     const\n     values = this.readSync(dataId);\n     const refCount = srcBackend.refCount(dataId);\n     // Delete the tensor from the\n     old backend and move it to the new\n     // backend.\n     srcBackend.disposeData(dataId, true);\n     info.backend =\n     backend;\n     backend.move(dataId, values, info.shape, info.dtype, refCount);\n     if\n     (this.shouldCheckForMemLeaks()) {\n     // Track the number of moves during a kernel execution to correctly\n     // detect memory leaks.\n     this.state.numDataMovesStack[this.state.numDataMovesStack.length - 1]++;\n     }\n     }\n     tidy<T extends TensorContainer>(nameOrFn: string|ScopeFn<T>, fn?: ScopeFn<T>):\n     T {\n     let name:\n     string = null;\n     if (fn == null) {\n     // Called with only 1 argument.\n     if (typeof nameOrFn !== 'function') {\n     throw new Error('Please provide a function to tidy()');\n     }\n     fn = nameOrFn;\n     } else {\n     // Called with\n     2 arguments.\n     if (typeof nameOrFn !== 'string' && !(nameOrFn instanceof String)) {\n     throw new Error(\n     `When calling with two arguments, the first argument` +\n     ` to tidy() must be a string`);\n     }\n     if\n     (typeof fn !== 'function') {\n     throw new Error(\n     `When calling with two arguments, the 2nd argument`\n     +\n     ` to tidy() must be a function`);\n     }\n     name = nameOrFn as string;\n     // TODO(nsthorat,smilkov):

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Do operation logging and performance\n // profiling.\n }\n let result: T;\n return this.scopedRun(\n ()\n => this.startScope(name), () => this.endScope(result), () => {\n     result = fn();\n     if (result instanceof\n Promise) {\n         console.error('Cannot return a Promise inside of tidy.);\n     }\n     return result;\n });\n }\n\n private scopedRun<T>(start: () => void, end: () => void, f: () => T): T {\n start();\n try {\n     const\n res = f();\n     end();\n     return res;\n } catch (ex) {\n     end();\n     throw ex;\n }\n }\n\n private static\n nextTensorId = 0;\n private nextTensorId(): number {\n return Engine.nextTensorId++;\n }\n\n private static\n nextVariableId = 0;\n private nextVariableId(): number {\n return Engine.nextVariableId++;\n }\n\n /**\n * This method is called instead of the public-facing tensor.clone() when\n * saving a tensor for backwards pass. It makes sure to add the clone\n * operation to the tape regardless of being called inside a kernel\n * execution.\n */\n private clone(x: Tensor): Tensor {\n     const y: Tensor = ENGINE.runKernel(Identity, {x} as {} as\n NamedTensorMap);\n     const inputs = {x};\n     const grad = (dy: Tensor) => ({\n         x: () => {\n             const dtype =\n 'float32';\n             const gradInputs = {x: dy};\n             const attrs = {dtype};\n             return ENGINE.runKernel(\n                 Cast, gradInputs as {} as NamedTensorMap,\n                 // tslint:disable-next-line: no-unnecessary-type-\n assertion\n                 attrs as {} as NamedAttrMap) as Tensor;\n         }\n     });\n     const saved: Tensor[] = [];\n     this.addTapeNode(this.state.activeScope.name, inputs, [y], grad, saved, {});\n     return y;\n }\n\n /**\n * Execute a kernel with the given name and return the output tensor.\n */\n * @param kernelName The name of the kernel to execute.\n * @param inputs A map of input names to tensors.\n * @param attrs A map of attribute names to their values. An attribute is a\n * primitive (non-tensor) input to the kernel.\n * @param inputsToSave A list of tensors, inputs to save for the backprop\n * computation.\n * @param outputsToSave A list of booleans, specifying which output to save\n * for the backprop computation. These are booleans since the output\n * tensors are not visible to the user.\n */\n runKernel<T extends Tensor|Tensor[]>(\n     kernelName: string, inputs:\n NamedTensorMap, attrs?: NamedAttrMap): T {\n     const hasKernel = getKernel(kernelName, this.backendName)\n != null;\n     if (!hasKernel) {\n         throw new Error(`Kernel '${kernelName}' not registered for backend '${\n this.backendName}'`);\n     }\n     return this.runKernelFunc({kernelName, inputs, attrs});\n }\n\n private\n shouldCheckForMemLeaks(): boolean {\n return this.ENV.getBool('IS_TEST');\n }\n\n private\n checkKernelForMemLeak(\n     kernelName: string, numDataIdsBefore: number,\n     outInfos: TensorInfo[]): void {\n     const numDataIdsAfter = this.backend.numDataIds();\n     // Count the number of data ids associated with the\n result of the kernel.\n     let numOutputDataIds = 0;\n     outInfos.forEach(info => {\n         // Complex numbers allocate\n 3 data ids, one for 'real', one for\n         // 'imaginary', and one for the container that holds the former two.\n numOutputDataIds += (info.dtype === 'complex64' ? 3 : 1);\n     });\n     // Account for the number of moves during\n kernel execution. A "data move"\n     // can happen in the middle of a kernel execution, placing a new (key,value)\n // pair in the data storage. Since data moves have net zero effect (we\n     // always remove the data from the old\n backend), we have to cancel them out\n     // when detecting memory leaks.\n     const numMoves =\n this.state.numDataMovesStack[this.state.numDataMovesStack.length - 1];\n     const dataIdsLeaked =\n numDataIdsAfter - numDataIdsBefore - numOutputDataIds - numMoves;\n     if (dataIdsLeaked > 0) {\n         throw\n new Error(\n             `Backend '${this.backendName}' has an internal memory leak ` +\n             `(${dataIdsLeaked}\n data ids) after running '${kernelName}'`);\n     }\n }\n\n /**\n * Internal helper method to execute a kernel Func\n */\n * Use `runKernel` to execute kernels from outside of engine.\n */\n private runKernelFunc<T extends\n Tensor|Tensor[], I extends NamedTensorMap>(\n     kernelParams: RegisteredKernelInvocation<I>|\n CustomGradKernelInvocation<T, I>): T {\n     let outputs: Tensor[];\n     let saved: Tensor[] = [];\n     const isTapeOn\n = this.isTapeOn();\n     const startingBytecount = this.state.numBytes;\n     const startingNumTensors =\n this.state.numTensors;\n     if (this.shouldCheckForMemLeaks()) {\n         this.state.numDataMovesStack.push(0);\n     }\n     let kernelFunc: () => Tensor[];\n     if (this.backendName == null) {\n         // backend has not been initialized\n yet (backend initialization is lazy\n         // can be deferred until an op/ kernel is run).\n         // The below getter has side\n effects that will try to initialize the\n         // backend and set properties like this.backendName\n         // tslint:disable-\n next-line: no-unused-expression\n         this.backend;\n     }\n     let out: TensorInfo|TensorInfo[];\n     const\n kernelOrScopeName = isRegisteredKernelInvocation(kernelParams) ?\n kernelParams.kernelName :\n this.state.activeScope != null ? this.state.activeScope.name : '';\n     // Create the kernelFunc from either a registered

```

```

kernel OR passed in\n // forward/backward functions (used by custom grad). In this context a\n // kernelFunc
wraps a kernel implementation with some bookkeeping.\n\n if (isRegisteredKernelInvocation(kernelParams)) {\n
  const {kernelName, inputs, attrs} = kernelParams;\n  if (this.backendName == null) {\n    // backend has not
been initialized yet (backend initialization is lazy\n // can be deferred until an op/ kernel is run).\n    // The
below getter has side effects that will try to initialize the\n // backend and set properties like
this.backendName\n // tslint:disable-next-line: no-unused-expression\n    this.backend;\n  }\n  const
kernel = getKernel(kernelName, this.backendName);\n  util.assert(\n    kernel != null,\n    () => `Cannot
find registered kernel '${kernelName}' for backend '${\n    this.backendName}')`);\n\n  kernelFunc = () =>
{\n    const numDataIdsBefore = this.backend.numDataIds();\n    out = kernel.kernelFunc({inputs, attrs,
backend: this.backend});\n    const outInfos = Array.isArray(out) ? out : [out];\n    if
(this.shouldCheckForMemLeaks()) {\n      this.checkKernelForMemLeak(kernelName, numDataIdsBefore,
outInfos);\n    }\n    const outTensors = outInfos.map((outInfo: TensorInfo|Tensor) => {\n      // todo
(yassogba) remove this option (Tensor) when node backend\n // methods have been modularized and they all
return tensorInfo.\n // TensorInfos do not have a rank attribute.\n      if ((outInfo as Tensor).rank != null) {\n
        return outInfo as Tensor;\n      }\n      const {dataId, shape, dtype} = outInfo as TensorInfo;\n      return
this.makeTensorFromDataId(dataId, shape, dtype);\n    });\n\n    // Save any required inputs and outputs.\n\n
// Do not save unless we are recording to the tape. Otherwise it would\n // cause a mem leak since there would
be no backprop for these tensors\n // (which would otherwise dispose them).\n    if (isTapeOn) {\n      const
tensorsToSave =\n        this.getTensorsForGradient(kernelName, inputs, outTensors);\n      saved =
this.saveTensorsForBackwardMode(tensorsToSave);\n    }\n    return outTensors;\n  };\n } else {\n
const {forwardFunc} = kernelParams;\n // Running a customGrad op.\n    const saveFunc: GradSaveFunc =
(tensors) => {\n      // Do not save unless we are recording to the tape. Otherwise it would\n // cause a mem
leak since we would never run backprop, which disposes\n // the kept tensors.\n      if (!isTapeOn) {\n
return;\n      }\n      saved = tensors.map(tensor => this.keep(this.clone(tensor)));\n    };\n\n    kernelFunc = () =>
{\n      const numDataIdsBefore = this.backend.numDataIds();\n      out = this.tidy(() =>
forwardFunc(this.backend, saveFunc));\n      const outs = (Array.isArray(out) ? out : [out]) as Tensor[];\n      if
(this.shouldCheckForMemLeaks()) {\n        // Scope name is used to print a more helpful error message if
needed.\n        this.checkKernelForMemLeak(kernelOrScopeName, numDataIdsBefore, outs);\n      }\n      return
outs;\n    };\n  }\n\n  /\n // Run the kernelFunc. Optionally profiling it.\n  /\n  const {inputs, attrs} =
kernelParams;\n  const backwardsFunc = isRegisteredKernelInvocation(kernelParams) ?\n    null : \n
kernelParams.backwardsFunc;\n\n  let kernelProfile: KernelProfile;\n  this.scopedRun(\n    // Stop recording to
a tape when running a kernel.\n    () => this.state.kernelDepth++, () => this.state.kernelDepth--, () => {\n      if
(!this.ENV.getBool('DEBUG') && !this.state.profiling) {\n        outputs = kernelFunc();\n      } else {\n
kernelProfile = this.profiler.profileKernel(\n        kernelOrScopeName, inputs, () => kernelFunc());\n      if
(this.ENV.getBool('DEBUG')) {\n        this.profiler.logKernelProfile(kernelProfile);\n      }\n      outputs
= kernelProfile.outputs;\n    };\n  });\n\n  if (isTapeOn) {\n    this.addTapeNode(\n
kernelOrScopeName, inputs, outputs, backwardsFunc, saved, attrs);\n  }\n\n  if (this.state.profiling) {\n
this.state.activeProfile.kernels.push({\n    name: kernelOrScopeName,\n    bytesAdded: this.state.numBytes -
startingBytecount,\n    totalBytesSnapshot: this.state.numBytes,\n    tensorsAdded: this.state.numTensors -
startingNumTensors,\n    totalTensorsSnapshot: this.state.numTensors,\n    inputShapes:
Object.keys(inputs).map(\n      key => inputs[key] != null ? inputs[key].shape : null),\n    outputShapes:
outputs.map(item => item.shape),\n    kernelTimeMs: kernelProfile.timeMs,\n    extraInfo:
kernelProfile.extraInfo\n  });\n  }\n  return (Array.isArray(out) ? outputs : outputs[0]) as T;\n }\n\n /**\n *
Saves tensors used in forward mode for use in backward mode.\n * @param tensors the list of tensors to
save.\n */\n private saveTensorsForBackwardMode(tensors: Tensor[]): Tensor[] {\n  const saved =
tensors.map(tensor => this.keep(this.clone(tensor)));\n  return saved;\n }\n\n /**\n * Returns a list of tensors to
save for a given gradient calculation.\n * @param kernelName name of kernel to look up gradient for.\n *
@param inputs a map of input tensors.\n * @param outputs an array of output tensors from forward mode of

```

```

kernel.\n *\n private getTensorsForGradient(\n   kernelName: string, inputs: NamedTensorMap,\n   outputs: Tensor[]): Tensor[]|null {\n   const gradConfig = getGradient(kernelName);\n   if (gradConfig != null) {\n     const\n     inputsToSave: string[] = gradConfig.inputsToSave || [];\n     const outputsToSave: boolean[] =\n     gradConfig.outputsToSave || [];\n\n     // If saveAllInputs is true, all inputs will be saved. Otherwise, inputs\n     // specified in inputsToSave will be saved.\n     let inputTensorsToSave: Tensor[];\n     if (gradConfig.saveAllInputs)\n     {\n       util.assert(\n         Array.isArray(inputs),\n         () => 'saveAllInputs is true, expected inputs to be an\n         array.');

```

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this.state.numStringTensors--;\n    this.state.numBytes -= info.bytes;\n    }\n    // Don't count bytes for complex
numbers as they are counted by their\n    // components.\n    if (a.dtype !== 'complex64' && a.dtype !== 'string') {\n
    const bytes = a.size * util.bytesPerElement(a.dtype);\n    this.state.numBytes -= bytes;\n    }\n    // Remove the
reference to dataId if backend dispose the data successfully\n    if (info.backend.disposeData(a.dataId)) {\n
this.removeDataId(a.dataId, info.backend);\n    }\n    // TODO(nsthorat): Construct an error and save the stack
trace for\n    // debugging when in debug mode. Creating a stack trace is too expensive\n    // to do unconditionally.\n
}\n\n    disposeVariables(): void {\n    for (const varName in this.state.registeredVariables) {\n    const v =
this.state.registeredVariables[varName];\n    this.disposeVariable(v);\n    }\n    }\n\n    disposeVariable(v: Variable):
void {\n    this.disposeTensor(v);\n    if (this.state.registeredVariables[v.name] != null) {\n    delete
this.state.registeredVariables[v.name];\n    }\n    }\n\n    memory(): MemoryInfo {\n    const info =
this.backend.memory() as MemoryInfo;\n    info.numTensors = this.state.numTensors;\n    info.numDataBuffers =
this.state.numDataBuffers;\n    info.numBytes = this.state.numBytes;\n    if (this.state.numStringTensors > 0) {\n
info.unreliable = true;\n    if (info.reasons === null) {\n    info.reasons = [];\n    }\n    info.reasons.push(\n
'Memory usage by string tensors is approximate ' +\n    '(2 bytes per character)');\n    }\n    return info;\n    }\n\n
async profile(query: () => (TensorContainer | Promise<TensorContainer>)): Promise<ProfileInfo> {\n
this.state.profiling = true;\n\n    const startBytes = this.state.numBytes;\n    const startNumTensors =
this.state.numTensors;\n\n    this.state.activeProfile.kernels = [];\n    this.state.activeProfile.result = await
query();\n\n    this.state.profiling = false;\n\n    this.state.activeProfile.peakBytes = Math.max(\n
...this.state.activeProfile.kernels.map(d => d.totalBytesSnapshot));\n    this.state.activeProfile.newBytes =
this.state.numBytes - startBytes;\n    this.state.activeProfile.newTensors =\n    this.state.numTensors -
startNumTensors;\n    for (const kernel of this.state.activeProfile.kernels) {\n    kernel.kernelTimeMs = await
kernel.kernelTimeMs;\n    kernel.extraInfo = await kernel.extraInfo;\n    }\n    return this.state.activeProfile;\n
}\n\n    isTapeOn(): boolean {\n    return this.state.gradientDepth > 0 && this.state.kernelDepth === 0;\n    }\n\n
private addTapeNode(\n    kernelName: string, inputs: NamedTensorMap, outputs: Tensor[],\n    gradientsFunc:
GradFunc, saved: Tensor[], attrs: NamedAttrMap): void {\n    const tapeNode: TapeNode =\n    {id:
this.state.nextTapeNodeId++, kernelName, inputs, outputs, saved};\n\n    const gradConfig =
getGradient(kernelName);\n    if (gradConfig != null) {\n    gradientsFunc = gradConfig.gradFunc;\n    }\n    if
(gradientsFunc != null) {\n    tapeNode.gradient = (dys: Tensor[]) => {\n    // TODO(smilkov): To optimize
back-prop, pass dys that are not used in\n    // the backprop graph to the user as null instead of zeros\n    dys =
dys.map((dy, i) => {\n    if (dy == null) {\n    const output = outputs[i];\n    const vals =
util.makeZerosTypedArray(output.size, output.dtype);\n    return this.makeTensor(vals, output.shape,
output.dtype);\n    }\n    return dy;\n    });\n    // Grad functions of ops with single outputs expect a dy,
while ops\n    // with multiple outputs expect dys (array of dy).\n    return gradientsFunc(dys.length > 1 ? dys :
dys[0], saved, attrs);\n    };\n    }\n    this.state.activeTape.push(tapeNode);\n    }\n\n    keep<T extends
Tensor>(result: T): T {\n    result.kept = true;\n    return result;\n    }\n\n    private startTape() {\n    if
(this.state.gradientDepth === 0) {\n    this.state.activeTape = [];\n    }\n    this.state.gradientDepth++;\n    }\n\n
private endTape() {\n    this.state.gradientDepth--;\n    }\n\n    /**\n    * Start a scope. Use this with endScope() to
achieve the same functionality\n    * as scope() without the need for a function closure.\n    */\n    startScope(name?:
string) {\n    const scopeInfo: ScopeState = {\n    track: [],\n    name: 'unnamed scope',\n    id:
this.state.nextScopeId++\n    };\n    if (name) {\n    scopeInfo.name = name;\n    }\n
this.state.scopeStack.push(scopeInfo);\n    this.state.activeScope = scopeInfo;\n    }\n\n    /**\n    * End a scope. Use
this with startScope() to achieve the same functionality\n    * as scope() without the need for a function closure.\n
*/\n    endScope(result?: TensorContainer) {\n    const tensorsToTrackInParent = getTensorsInContainer(result);\n
const tensorsToTrackInParentSet =\n    new Set(tensorsToTrackInParent.map(t => t.id));\n\n    // Dispose the
arrays tracked in this scope.\n    for (let i = 0; i < this.state.activeScope.track.length; i++) {\n    const tensor =
this.state.activeScope.track[i];\n    if (!tensor.kept && !tensorsToTrackInParentSet.has(tensor.id)) {\n
tensor.dispose();\n    }\n    }\n\n    const oldScope = this.state.scopeStack.pop();\n    this.state.activeScope =
this.state.scopeStack.length === 0 ?\n    null :\n    this.state.scopeStack[this.state.scopeStack.length - 1];\n    //

```

```

Track the current result in the parent scope.\n  tensorsToTrackInParent.forEach(tensor => {\n    // Only track the
tensor if was allocated in the inner scope and is not\n    // globally kept.\n    if (!tensor.kept && tensor.scopedId
=== oldScope.id) {\n      this.track(tensor);\n    }\n  });\n  }\n  /**\n   * Returns gradients of `f` with respect to
each of the `xs`. The gradients\n   * returned are of the same length as `xs`, but some might be null if `f`\n   * was
not a function of that `x`. It also takes optional dy to multiply the\n   * gradient, which defaults to `1`.\n   */\n  gradients<T extends Tensor>(\n    f: () => T, xs: Tensor[], dy?: T,\n    allowNoGradients = false): {value: T,
grads: Tensor[]} {\n    util.assert(\n      xs.length > 0, () => 'gradients() received an empty list of xs.);\n    if (dy !=
null && dy.dtype !== 'float32') {\n      throw new Error(`dy must have 'float32' dtype, but has '${dy.dtype}'`);\n    }\n    const y = this.scopedRun(\n      () => this.startTape(), () => this.endTape(),\n      () => this.tidy('forward',
f));\n    util.assert(\n      y instanceof Tensor,\n      () => 'The result y returned by f() must be a tensor.);\n    //
Filter out the nodes that don't connect x => y.\n    const filteredTape = getFilteredNodesXToY(this.state.activeTape,
xs, y);\n    if (!allowNoGradients && filteredTape.length === 0 && xs.length > 0) {\n      throw new Error(\n
'Cannot compute gradient of y=f(x) with respect to x. Make sure '+\n      'that the f you passed encloses all
operations that lead from x '+\n      'to y.);\n    }\n    return this.tidy('backward', () => {\n      const
accumulatedGradientMap: {[tensorId: number]: Tensor} = {};\n      accumulatedGradientMap[y.id] = (dy == null) ?
ones(y.shape) : dy;\n      // Backprop gradients through the filtered nodes.\n      backpropagateGradients(\n
accumulatedGradientMap, filteredTape,\n        // Pass the tidy function to avoid circular dep with `tape.ts`.\n        f
=> this.tidy(f as ScopeFn<Tensor>),\n        // Pass an add function to avoid a circular dep with `tape.ts`.\n
add);\n      const grads = xs.map(x => accumulatedGradientMap[x.id]);\n      if (this.state.gradientDepth === 0) {\n
// This means that we are not computing higher-order gradients\n      // and can clean up the tape.\n      this.state.activeTape.forEach(node => {\n        for (const tensor of node.saved) {\n          tensor.dispose();\n        }\n      });\n      this.state.activeTape = null;\n    }\n    return {value: y, grads};\n  });\n  }\n  customGrad<T
extends Tensor>(f: CustomGradientFunc<T>):\n    (...args: Array<Tensor|GradSaveFunc>) => T {\n    util.assert(\n
util.isFunction(f),\n      () => 'The f passed in customGrad(f) must be a function.);\n    return (...inputs:
Tensor[]): T => {\n      util.assert(\n        inputs.every(t => t instanceof Tensor),\n        () => 'The args passed in
customGrad(f)(x1, x2,...) must all be '+\n        'tensors');\n      let res: {\n        value: T,\n        gradFunc: (dy: T,
saved: Tensor[]) => Tensor | Tensor[],\n      }; \n      const inputMap: NamedTensorMap = {};\n      inputs.forEach((input, i) => {\n        inputMap[i] = input;\n      });\n      const forwardFunc: ForwardFunc<T> = (_,
save) => {\n        res = f(...inputs, save);\n        util.assert(\n          res.value instanceof Tensor,\n          () =>
'The function f passed in customGrad(f) must return an '+\n          'object where `obj.value` is a tensor');\n        util.assert(\n          util.isFunction(res.gradFunc),\n          () => 'The function f passed in customGrad(f) must return
an '+\n          'object where `obj.gradFunc` is a function.);\n        return res.value;\n      });\n      const
backwardsFunc = (dy: T, saved: Tensor[]) => {\n        const gradRes = res.gradFunc(dy, saved);\n        const grads:
Tensor[] = Array.isArray(gradRes) ? gradRes : [gradRes];\n        util.assert(\n          grads.length ===
inputs.length,\n          () => 'The function f passed in customGrad(f) must return an '+\n          'object where
`obj.gradFunc` is a function that returns '+\n          'the same number of tensors as inputs passed to f(...).);\n        util.assert(\n          grads.every(t => t instanceof Tensor),\n          () => 'The function f passed in customGrad(f)
must return an '+\n          'object where `obj.gradFunc` is a function that returns '+\n          'a list of only
tensors.);\n        const gradMap: {[key: string]: () => Tensor} = {};\n        grads.forEach((grad, i) => {\n
          gradMap[i] = () => grad;\n        });\n        return gradMap;\n      });\n      return this.runKernelFunc({\n
forwardFunc,\n        backwardsFunc,\n        inputs: inputMap,\n      });\n    }\n  }\n  readSync(dataId: DataId):
BackendValues {\n    // Route the read to the correct backend.\n    const info = this.state.tensorInfo.get(dataId);\n    return info.backend.readSync(dataId);\n  }\n  read(dataId: DataId): Promise<BackendValues> {\n    // Route the read
to the correct backend.\n    const info = this.state.tensorInfo.get(dataId);\n    return info.backend.read(dataId);\n  }\n  async time(query: () => void): Promise<TimingInfo> {\n    const start = now();\n    const timingInfo = await
this.backend.time(query) as TimingInfo;\n    timingInfo.wallMs = now() - start;\n    return timingInfo;\n  }\n  /**\n   * Tracks a Tensor in the current scope to be automatically cleaned up\n   * when the current scope ends, and returns
the value.\n   */\n   * @param result The Tensor to track in the current scope.\n   */\n  private track<T extends

```

```

Tensor<(result: T): T {
  if (this.state.activeScope != null) {
    result.scopeId = this.state.activeScope.id;
    this.state.activeScope.track.push(result);
  }
  return result;
}
get registeredVariables():
NamedVariableMap {
  return this.state.registeredVariables;
}
/**
 * Resets the engine state. Removes
all backends but does not remove
 * registered backend factories.
 */
reset(): void {
  // Make any pending
promise obsolete.
  this.pendingBackendInitId++;
  this.state.dispose();
  this.ENV.reset();
  this.state =
new EngineState();
  for (const backendName in this.registry) {
    this.disposeRegisteredKernels(backendName);
    this.registry[backendName].dispose();
    delete
this.registry[backendName];
  }
  this.backendName = null;
  this.backendInstance = null;
  this.pendingBackendInit = null;
}
function ones(shape: number[]): Tensor {
  const values =
makeOnesTypedArray(sizeFromShape(shape), 'float32');
  return ENGINE.makeTensor(values, shape,
'float32');
}
export function getOrMakeEngine(): Engine {
  const ns = getGlobalNamespace() as { } as
{ _tfengine: Engine };
  if (ns._tfengine == null) {
    const environment = new Environment(ns);
    ns._tfengine =
new Engine(environment);
  }
  setEnvironmentGlobal(ns._tfengine.ENV);
  // Tell the current tensor interface
that the global engine is responsible
  // for tracking.
  setTensorTracker(() => ns._tfengine);
  return
ns._tfengine;
}
export const ENGINE = getOrMakeEngine();
/**
 * A implementation of the add op for use
within engine and tape.
 * This allows us to avoid a circular dependency between add.ts and engine.
 * It is
exported to be available in tape tests.
 */
export function add(a: Tensor, b: Tensor): Tensor {
  // We duplicate
Add here to avoid a circular dependency with add.ts.
  const inputs = { a, b };
  return ENGINE.runKernel(Add,
inputs as { } as NamedTensorMap);
}
"/**
 * @license
 * Copyright 2017 Google LLC. All Rights
Reserved.
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file
except in compliance with the License.
 * You may obtain a copy of the License at
 *
http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing,
software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language
governing permissions and
 * limitations under the License.
 */
=====
*/
// tslint:disable-next-line:no-any
function _isNavigatorDefined(): boolean {
  return typeof navigator !==
'undefined' && navigator != null;
}
export function isMobile(): boolean {
  if (_isNavigatorDefined()) {
    // tslint:disable-next-line:no-any
    const a = navigator.userAgent || navigator.vendor || (window as any).opera;
    // tslint:disable-next-line:max-line-length
    return
/(android|bb\d+|meego).+mobile|avantgo|bada\b|blackberry|blazer|compal|elaine|fennec|hiptop|iemobile|i(hone|od)|
iris|kindle|lge |maemo|midp|mmp|mobile.+firefox|netfront|opera m(ob|in)i|palm(
os)?|phone|p(ixi|re)\b|plucker|pocket|psp|series(4|6|0)|symbian|treo|up\.(browser|link)|vodafone|wap|windows
ce|xda|xiino/i
    .test(a) ||
    // tslint:disable-next-line:max-line-length
    /1207|6310|6590|3gso|4thp|50[1-6]|i770s|802s|a wa|abac|ac(er|oo|s|-
)|ai(ko|rn)|al(av|ca|co)|amoi|an(ex|ny|yw)|aptu|ar(ch|go)|as(te|us)|attw|au(di|-m|r |s
)|avan|be(ck|ll|nq)|bi(lb|rd)|bl(ac|az)|br(e|v)w|bumb|bw\-(n|u)c55|/capi|ccwa|cdm\|-|cell|chtm|cldc|cmd\|-
|co(mp|nd)|craw|da(it|ll|ng)|dbte|dc\|-s|devi|dica|dmob|do(c|p)o|ds(12|-d)|el(49|ai)|em(l2|ul)|er(ic|k0)|esl8|ez([4-
7]|0|os|wa|ze)|fetc|fly(\-|_)g1 u|g560|gene|gf|-5|g\|-mo|go(\.w|od)|gr(ad|un)|haie|hcit|hd\-(m|p|t)|hei\|-|hi(pt|ta)|hp(
i|ip)|hs\|-|ht(c\|-|_|a|g|p|s|t)|tp)|hu(aw|tc)i\-(20|go|ma)|i230|iac (|-
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v)|vm40|voda|vulc|vx(52|53|60|61|70|80|81|83|85|98)|w3c(\\-| )|webc|whit|wi(g|nc|nw)|wmlb|wonu|x700|yas|-
|your|zeto|zte|-/i|n      .test(a.substr(0, 4));\n } \n return false;\n }\n\nexport function isBrowser(): boolean {\n
return (typeof window !== 'undefined' && window.document !== null) ||\n    //@ts-ignore\n    (typeof
WorkerGlobalScope !== 'undefined');\n }\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*\nimport './engine';\nimport * as device_util from './device_util';\nimport {env} from './environment';\nconst
ENV = env();\n\n/**\n * This file contains environment-related flag registrations.\n *\n/** Whether to enable
debug mode. *\nENV.registerFlag('DEBUG', () => false, debugValue => {\n if (debugValue) {\n
console.warn(\n    'Debugging mode is ON. The output of every math call will ' +\n    'be downloaded to CPU
and checked for NaNs. ' +\n    'This significantly impacts performance.);\n } \n});\n\n/** Whether we are in a
browser (as versus, say, node.js) environment. *\nENV.registerFlag('IS_BROWSER', () =>
device_util.isBrowser());\n\n/** Whether we are in a browser (as versus, say, node.js) environment.
*\nENV.registerFlag(\n  'IS_NODE',\n  () => (typeof process !== 'undefined') &&\n    (typeof process.versions
!== 'undefined') &&\n    (typeof process.versions.node !== 'undefined'));\n\n/** Whether this browser is Chrome.
*\nENV.registerFlag(\n  'IS_CHROME',\n  () => typeof navigator !== 'undefined' && navigator !== null &&\n
navigator.userAgent !== null && /Chrome/.test(navigator.userAgent) &&\n    /Google
Inc/.test(navigator.vendor));\n\n/**\n * True when the environment is "production" where we disable safety
checks\n * to gain performance.\n *\nENV.registerFlag('PROD', () => false);\n\n/**\n * Whether to do sanity
checks when inferring a shape from user-provided\n * values, used when creating a new tensor.\n
*\nENV.registerFlag(\n  'TENSORLIKE_CHECK_SHAPE_CONSISTENCY', () =>
ENV.getBool('DEBUG'));\n\n/** Whether deprecation warnings are enabled.
*\nENV.registerFlag('DEPRECATION_WARNINGS_ENABLED', () => true);\n\n/** True if running unit tests.
*\nENV.registerFlag('IS_TEST', () => false);\n\n/** Whether to check computation result for errors.
*\nENV.registerFlag('CHECK_COMPUTATION_FOR_ERRORS', () => true);\n\n"/**\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*\nimport {ENGINE} from './engine';\nimport {env} from './environment';\nimport {Tensor} from
 './tensor';\nimport {DataType, TensorLike} from './types';\nimport {assert, flatten, inferDtype, isTypedArray,
toTypedArray} from './util';\n\nexport function inferShape(val: TensorLike, dtype?: DataType): number[] {\n
let firstElem: typeof val = val;\n if (isTypedArray(val)) {\n return dtype === 'string' ? [] : [val.length];\n } \n
if (!Array.isArray(val)) {\n return []; // Scalar.\n } \n const shape: number[] = [];\n\n while
(Array.isArray(firstElem) ||\n    isTypedArray(firstElem) && dtype !== 'string') {\n
shape.push(firstElem.length);\n firstElem = firstElem[0];\n } \n if (Array.isArray(val) &&\n
env().getBool('TENSORLIKE_CHECK_SHAPE_CONSISTENCY')) {\n deepAssertShapeConsistency(val,
shape, []);\n } \n\n return shape;\n }\n\nfunction deepAssertShapeConsistency(\n  val: TensorLike, shape:

```

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number[], indices: number[]) {\n indices = indices || [];\n if (!(Array.isArray(val)) && !isTypedArray(val)) {\n
assert(\n shape.length === 0,\n () => `Element arr[${indices.join('[]')}] is a primitive, ` +\n `but
should be an array/TypedArray of ${shape[0]} elements`);\n return;\n }\n assert(\n shape.length > 0,\n ()
=> `Element arr[${indices.join('[]')}] should be a primitive, ` +\n `but is an array of ${val.length}
elements`);\n assert(\n val.length === shape[0],\n () => `Element arr[${indices.join('[]')}] should have
${shape[0]} ` +\n `elements, but has ${val.length} elements`);\n const subShape = shape.slice(1);\n for (let i
= 0; i < val.length; ++i) {\n deepAssertShapeConsistency(val[i], subShape, indices.concat(i));\n }\n}\n\nfunction
assertDType(\n expectedDtype: DataType|'numeric'|'string_or_numeric',\n actualDType: DataType, argName:
string, functionName: string) {\n if (expectedDtype === 'string_or_numeric') {\n return;\n }\n if (expectedDtype
== null) {\n throw new Error(`Expected dtype cannot be null.`);\n }\n if (expectedDtype !== 'numeric' &&
expectedDtype !== actualDType ||\n expectedDtype === 'numeric' && actualDtype === 'string') {\n throw
new Error(\n `Argument '${argName}' passed to '${functionName}' must ` +\n `be ${expectedDtype}
tensor, but got ${actualDType} tensor`);\n }\n}\n\nexport function convertToTensor<T extends Tensor>(\n x:
T|TensorLike, argName: string, functionName: string,\n parseAsDtype: DataType|'numeric'|'string_or_numeric' =
'numeric'): T {\n if (x instanceof Tensor) {\n assertDType(parseAsDtype, x.dtype, argName, functionName);\n
return x;\n }\n let inferredDtype = inferDtype(x);\n // If the user expects a bool/int/float, use that info to update
the\n // inferredDtype when it is not a string.\n if (inferredDtype !== 'string' &&\n ['bool', 'int32',
'float32'].indexOf(parseAsDtype) >= 0) {\n inferredDtype = parseAsDtype as DataType;\n }\n
assertDType(parseAsDtype, inferredDtype, argName, functionName);\n if ((x == null) ||\n (!isTypedArray(x)
&& !Array.isArray(x) && typeof x !== 'number' &&\n typeof x !== 'boolean' && typeof x !== 'string')) {\n
const type = x == null ? 'null' : (x as {}).constructor.name;\n throw new Error(\n `Argument '${argName}'
passed to '${functionName}' must be a ` +\n `Tensor or TensorLike, but got '${type}'`);\n }\n const
inferredShape = inferShape(x, inferredDtype);\n if (!isTypedArray(x) && !Array.isArray(x)) {\n x = [x] as
number[];\n }\n const skipTypedArray = true;\n const values = inferredDtype !== 'string' ?\n toTypedArray(x,
inferredDtype as DataType) :\n flatten(x as string[], [], skipTypedArray) as string[];\n return
ENGINE.makeTensor(values, inferredShape, inferredDtype) as T;\n}\n\nexport function convertToTensorArray<T
extends Tensor>(\n arg: Array<T|TensorLike>, argName: string, functionName: string,\n parseAsDtype:
DataType|'numeric'|'string_or_numeric' = 'numeric'): T[] {\n if (!Array.isArray(arg)) {\n throw new Error(\n
`Argument ${argName} passed to ${functionName} must be a ` +\n `Tensor[] or TensorLike[]`);\n }\n
const tensors = arg as T[];\n return tensors.map(\n (t, i) =>\n convertToTensor(t, `${argName}[${i}]`,
functionName, parseAsDtype));\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====
*\nimport {ENGINE} from '../engine';\nimport {isPromise} from '../util';\n\nexport const OP_SCOPE_SUFFIX =
'__op';\n\n/**\n * Used for wrapping functions that perform math operations on\n * Tensors. The function will be
wrapped in a named scope that cleans all\n * memory usage after the function is done.\n *\nexport function op<T
extends Function>(f: {[name: string]: T}): T {\n const keys = Object.keys(f);\n if (keys.length !== 1) {\n
throw new Error(\n `Please provide an object with a single key ` +\n `(operation name) mapping to a function. Got
an object with ` +\n `${keys.length} keys.`);\n }\n\n let opName = keys[0];\n const fn = f[opName];\n\n //
Strip the underscore from the end of the function name.\n if (opName.endsWith('_')) {\n opName =
opName.substring(0, opName.length - 1);\n }\n\n // add an __op suffix to distinguish ops from kernels in
tf.profile\n opName = opName + OP_SCOPE_SUFFIX;\n\n // tslint:disable-next-line:no-any\n const f2 = (...args:
any[]) => {\n ENGINE.startScope(opName);\n try {\n const result = fn(...args);\n if (isPromise(result)) {\n

```



```

    console.error('Cannot return a Promise inside of tidy.');
```

```

    }
    ENGINE.endScope(result);
    return result;
  } catch (ex) {
    ENGINE.endScope(null);
    throw ex;
  }
};
Object.defineProperty(f2, 'name', { value: opName, configurable: true });
// tslint:disable-next-line:no-any
return f2 as any as T;
"/**
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 * Copyright 2020 Google LLC. All Rights Reserved.
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 * distributed under the License is distributed on an "AS IS"
 * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
=====
import {ENGINE} from '../engine';
import {Complex, ComplexInputs} from '../kernel_names';
import {Tensor} from '../tensor';
import {NamedTensorMap} from '../tensor_types';
import {convertToTensor} from '../tensor_util_env';
import {TensorLike} from '../types';
import * as util from '../util';
import {op} from '../operation';
"/**
 * Converts two real numbers to a complex number.
 * Given a tensor `real` representing the real part of a complex number, and a
 * tensor `imag` representing the imaginary part of a complex number, this
 * operation returns complex numbers elementwise of the form [r0, i0, r1, i1],
 * where r represents the real part and i represents the imag part.
 * The input tensors real and imag must have the same shape.
 */
const real = tf.tensor1d([2.25, 3.25]);
const imag = tf.tensor1d([4.75, 5.75]);
const complex = tf.complex(real, imag);
complex.print();
@doc {heading: 'Tensors', subheading: 'Creation'}
function complex_<T extends Tensor>(real: T|TensorLike, imag: T|TensorLike): T {
  const $real = convertToTensor(real, 'real', 'complex');
  const $imag = convertToTensor(imag, 'imag', 'complex');
  util.assertShapesMatch($real.shape, $imag.shape, `real and imag shapes, $${$real.shape} and $${$imag.shape}, ` +
    `must match in call to tf.complex().`);
  const inputs: ComplexInputs = {real: $real, imag: $imag};
  return ENGINE.runKernel(Complex, inputs as { } as NamedTensorMap);
}
export const complex = op({complex_});
"/**
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 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
=====
import {ENGINE} from '../engine';
import {Tensor} from '../tensor';
import {TensorLike, TypedArray} from '../types';
import {DataType} from '../types';
import {assert, assertNonNegativeIntegerDimensions, flatten, inferDtype, isArray, isArrayLike, sizeFromShape, toTypedArray} from '../util';
/** This is shared code across all tensor creation methods. */
export function makeTensor(values: TensorLike, shape: number[], inferredShape: number[], dtype?: DataType): Tensor {
  if (dtype == null) {
    dtype = inferDtype(values);
  }
  if (dtype === 'complex64') {
    throw new Error(`Cannot construct a complex64 tensor directly. ` +
      `Please use tf.complex(real, imag).`);
  }
  if (!isArrayLike(values) || !Array.isArray(values) ||
    typeof values !== 'number' ||
    typeof values !== 'boolean' ||
    typeof values !== 'string') {
    throw new Error(`values passed to tensor(values) must be a number/boolean/string or ` +
      `an array of numbers/booleans/strings, or a TypedArray`);
  }
  if (shape != null) {
    assertNonNegativeIntegerDimensions(shape);
    const providedSize = sizeFromShape(shape);
    const inferredSize = sizeFromShape(inferredShape);
    assert(providedSize === inferredSize,
      `Based on the provided shape, [${shape}], the tensor should have ` +
      `${providedSize} values but has ${inferredSize}`);
    for (let i = 0; i < inferredShape.length; ++i) {
      const inferred = inferredShape[i];
      const flatDimsDontMatch = i === inferredShape.length - 1 ?
        inferred !== sizeFromShape(shape.slice(i)) :
        true;
      assert(inferredShape[i] === shape[i] ||
        !flatDimsDontMatch,
        `Error creating a new Tensor. Inferred shape ` +
          `${inferredShape}`);
    }
  }
}

```

does not match the provided shape (\$shape).);
 if (!isArray(values) &&
 !Array.isArray(values)) {
 values = [values] as number[];
 shape = shape || inferredShape;
 dtype !== 'string' ?
 toTypedArray(values, dtype) :
 flatten(values as string[], [], true) as string[];
 return
 ENGINE.makeTensor(values as TypedArray, shape, dtype);
 }
 "*/
 @license
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 OR CONDITIONS OF ANY KIND, either express or implied.
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 governing permissions and
 limitations under the License.

```

=====
*/
import { Tensor } from './tensor';
import { inferShape } from './tensor_util_env';
import { TensorLike } from
 './types';
import { DataType, Rank, ShapeMap } from './types';
import { makeTensor } from
 './tensor_ops_util';
/**
 * Creates a `tf.Tensor` with the provided values, shape and dtype.
 *
 * Pass an array of values to create a vector.
 * tf.tensor([1, 2, 3, 4]).print();
 *
 * Pass a nested
 * array of values to make a matrix or a higher
 * // dimensional tensor.
 * tf.tensor([[1, 2], [3, 4]]).print();
 *
 * Pass a flat array and specify a shape yourself.
 * tf.tensor([1, 2, 3, 4], [2, 2]).print();
 *
 * @param values The values of the tensor. Can be nested array of numbers,
 * or a flat array, or a `TypedArray`. If
 * the values are strings,
 * they will be encoded as utf-8 and kept as `Uint8Array`.
 * @param shape The shape
 * of the tensor. Optional. If not provided,
 * it is inferred from `values`.
 * @param dtype The data type.
 *
 * @doc {heading: 'Tensors', subheading: 'Creation'}
 */
export function tensor<R> extends Rank>(\n values:
 TensorLike, shape?: ShapeMap[R], dtype?: DataType): Tensor<R> {\n const inferredShape = inferShape(values,
 dtype);\n return makeTensor(values, shape, inferredShape, dtype) as Tensor<R>;\n }
"*/
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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the specific language governing permissions and
limitations under the License.

```

```

=====
*/
Type definitions for exporting and importing of models.
A map from Tensor dtype to number
of bytes per element of the Tensor.
export const DTYPE_VALUE_SIZE_MAP: { [dtype: string]: number } =
{\n 'float32': 4,\n 'float16': 2,\n 'int32': 4,\n 'uint16': 2,\n 'uint8': 1,\n 'bool': 1,\n 'complex64': 8\n};
A
weight manifest.
The weight manifest consists of an ordered list of weight-manifest groups.
Each weight-
manifest group ("group" for short hereafter) consists of a
number of weight values stored in a number of
paths.
See the documentation of `WeightManifestGroupConfig` below for more details.
export declare
type WeightsManifestConfig = WeightsManifestGroupConfig[];
A weight-manifest group.
Consists of an ordered list of weight values encoded in binary format,
stored in an ordered list of paths.
export declare interface WeightsManifestGroupConfig {\n
/**
 * An ordered list of paths.
 * Paths are
 * intentionally abstract in order to be general. For example, they
 * can be relative URL paths or relative paths on
 * the file system.
 * paths: string[];
/**
 * Specifications of the weights stored in the paths.
 * weights: WeightsManifestEntry[];
}
Group to which the weight belongs.
- 'optimizer': Weight
from a stateful optimizer.
export type WeightGroup = 'model'|'optimizer';
An entry in the weight
manifest.
The entry contains specification of a weight.
export declare interface WeightsManifestEntry
{\n
/**
 * Name of the weight, e.g., 'Dense_1/bias'
 * name: string;
/**
 * Shape of the weight.
 * shape: number[];
/**
 * Data type of the weight.
 * dtype:
'float32'|'int32'|'bool'|'string'|'complex64';
/**
 * Type of the weight.
 * Optional.
 * The value
'optimizer' indicates the weight belongs to an optimizer
 * (i.e., used only during model training and not during

```

```

inference).\n *\n group?: WeightGroup;\n\n /**\n * Information for dequantization of the weight.\n *\n quantization?: {\n  scale?: number, // The scaling constant to multiply by.\n  min?: number, // The (possibly nudged) minimum weight to add.\n  dtype: 'uint16'|'uint8'|'float16' // The dtype of the quantized weights.\n};\n}\n\n/**\n * Options for saving a model.\n *\n @namespace io\n *\n export interface SaveConfig {\n /**\n * Whether to save only the trainable weights of the model, ignoring the\n * non-trainable ones.\n *\n trainableOnly?: boolean;\n\n /**\n * Whether the optimizer will be saved (if exists).\n *\n * Default: `false`.\n *\n includeOptimizer?: boolean;\n}\n\n/**\n * Result of a saving operation.\n *\n export interface SaveResult {\n /**\n * Information about the model artifacts saved.\n *\n modelArtifactsInfo: ModelArtifactsInfo;\n\n /**\n * HTTP responses from the server that handled the model-saving request (if\n * any). This is applicable only to server-based saving routes.\n *\n responses?: Response[];\n\n /**\n * Error messages and related data (if any).\n *\n errors?: Array<{ }|string>;\n}\n\n export declare interface ModelArtifactsInfo {\n /**\n * Timestamp for when the model is saved.\n *\n dateSaved: Date;\n\n /**\n * TODO (cais,yassogba) consider removing GraphDef as GraphDefs now\n * come in a JSON format and none of our IOHandlers support a non json\n * format. We could conder replacing this with 'Binary' if we want to\n * allow future handlers to save to non json formats (though they will\n * probably want more information than 'Binary').\n *\n type: 'JSON'|'GraphDef';\n\n /**\n * Type of the model topology\n *\n * Possible values:\n * - JSON: JSON config (human-readable, e.g., Keras JSON).\n * - GraphDef: TensorFlow\n *\n [GraphDef](https://www.tensorflow.org/extend/tool_developers/#graphdef)\n *\n protocol buffer (binary).\n *\n modelTopologyType: 'JSON'|'GraphDef';\n\n /**\n * Size of model topology (Keras JSON or GraphDef), in bytes.\n *\n modelTopologyBytes?: number;\n\n /**\n * Size of weight specification or manifest, in bytes.\n *\n weightSpecsBytes?: number;\n\n /**\n * Size of weight value data, in bytes.\n *\n weightDataBytes?: number;\n}\n\n /**\n * Model training configuration.\n *\n export declare interface TrainingConfig {\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n // See\n // tslint:disable-next-line:max-line-length\n // https://github.com/tensorflow/tfjs-layers/blob/master/src/keras_format/training_config.ts\n /**\n * Optimizer used for the model training.\n *\n optimizer_config: {};\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n /**\n * Loss function(s) for the model's output(s).\n *\n loss: string|string[]|{[key: string]: string};\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n /**\n * Metric function(s) for the model's output(s).\n *\n metrics?: string[]|{[key: string]: string};\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n weighted_metrics?: string[];\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n sample_weight_mode?: string;\n\n loss_weights?: number[]|{[key: string]: number};\n}\n\n /**\n * The serialized artifacts of a model, including topology and weights.\n *\n * The `modelTopology`, `trainingConfig`, `weightSpecs` and `weightData` fields\n * of this interface are optional, in order to support topology- or weights-only\n * saving and loading.\n *\n * Note this interface is used internally in IOHandlers. For the file format\n * written to disk as `model.json`, see `ModelJSON`.\n *\n export declare interface ModelArtifacts {\n /**\n * Model topology.\n *\n * For Keras-style `tf.Model`s, this is a JSON object.\n * For TensorFlow-style models (e.g., `SavedModel`), this is the JSON\n * encoding of the `GraphDef` protocol buffer.\n *\n modelTopology?: {}|ArrayBuffer;\n\n /**\n * Serialized configuration for the model's training.\n *\n trainingConfig?: TrainingConfig;\n\n /**\n * Weight specifications.\n *\n * This corresponds to the weightsData below.\n *\n weightSpecs?: WeightsManifestEntry[];\n\n /**\n * Binary buffer for all weight values concatenated in the order specified\n * by `weightSpecs`.\n *\n weightData?: ArrayBuffer;\n\n /**\n * Hard-coded format name for models saved from TensorFlow.js or converted\n * by TensorFlow.js Converter.\n *\n format?: string;\n\n /**\n * What library is responsible for originally generating this artifact.\n *\n * Used for debugging purposes. E.g., 'TensorFlow.js v1.0.0'.\n *\n generatedBy?: string;\n\n /**\n * What library or tool is responsible for converting the original model\n * to this format, applicable only if the model is output by a converter.\n *\n * Used for debugging purposes. E.g., 'TensorFlow.js Converter v1.0.0'.\n *\n * A value of `null` means the model artifacts are generated without any\n * conversion process (e.g., saved directly from a TensorFlow.js\n * `tf.LayersModel` instance).\n *\n convertedBy?: string|null;\n\n /**\n * Inputs and outputs signature for saved model.\n *\n signature?: {};\n\n /**\n * User-defined metadata about the model.\n *\n

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userDefinedMetadata?: {[key: string]: {}};\n\n /**\n * Initializer for the model.\n */\n modelInitializer?:\n {};\n\n /**\n * The on-disk format of the `model.json` file.\n */\n * TF.js 1.0 always populates the optional fields\n when writing model.json.\n * Prior versions did not provide those fields.\n */\n export declare interface ModelJSON\n {\n /**\n * Model topology.\n */\n * For Keras-style `tf.Model`s, this is a JSON object.\n * For TensorFlow-\n style models (e.g., `SavedModel`), this is the JSON\n * encoding of the `GraphDef` protocol buffer.\n */\n modelTopology: {};\n\n /** Model training configuration. */\n trainingConfig?: TrainingConfig;\n\n /**\n * Weights manifest.\n */\n * The weights manifest consists of an ordered list of weight-manifest\n * groups. Each\n weight-manifest group consists of a number of weight values\n * stored in a number of paths. See the\n documentation of\n * `WeightsManifestConfig` for more details.\n */\n weightsManifest:\n WeightsManifestConfig;\n\n /**\n * Hard-coded format name for models saved from TensorFlow.js or\n converted\n * by TensorFlow.js Converter.\n */\n format?: string;\n\n /**\n * What library is responsible for\n originally generating this artifact.\n */\n * Used for debugging purposes. E.g., 'TensorFlow.js v1.0.0'.\n */\n generatedBy?: string;\n\n /**\n * What library or tool is responsible for converting the original model\n * to this\n format, applicable only if the model is output by a converter.\n */\n * Used for debugging purposes. E.g.,\n 'TensorFlow.js Converter v1.0.0'.\n */\n * A value of `null` means the model artifacts are generated without any\n * conversion process (e.g., saved directly from a TensorFlow.js\n * `tf.LayersModel` instance.)\n */\n convertedBy?: string|null;\n\n /**\n * Inputs and outputs signature for saved model.\n */\n signature?: {};\n\n /**\n * User-defined metadata about the model.\n */\n userDefinedMetadata?: {[key: string]: {}};\n\n /**\n * Initializer for the model.\n */\n modelInitializer?: {};\n\n /**\n * Type definition for handlers of loading\n operations.\n */\n export type LoadHandler = () => Promise<ModelArtifacts>;\n\n /**\n * Type definition for\n handlers of saving operations.\n */\n export type SaveHandler = (modelArtifact: ModelArtifacts) =>\n Promise<SaveResult>;\n\n /**\n * Interface for a model import/export handler.\n */\n * The `save` and `load`\n handlers are both optional, in order to allow handlers\n * that support only saving or loading.\n */\n // tslint:disable-\n next-line:interface-name\n export interface IOHandler {\n save?: SaveHandler;\n load?: LoadHandler;\n }\n\n /**\n * An interface for the manager of a model store.\n */\n * A model store is defined as a storage medium on which\n multiple models can\n * be stored. Each stored model has a unique `path` as its identifier.\n */\n * A\n `ModelStoreManager` for the store allows actions including\n * - Listing the models stored in the store.\n * -\n Deleting a model from the store.\n */\n export interface ModelStoreManager {\n /**\n * List all models in the\n model store.\n */\n * @returns A dictionary mapping paths of existing models to their\n * model artifacts info.\n Model artifacts info include type of the model's\n * topology, byte sizes of the topology, weights, etc.\n */\n listModels(): Promise<{[path: string]: ModelArtifactsInfo}>;\n\n /**\n * Remove a model specified by `path`.\n */\n * @param path\n * @returns ModelArtifactsInfo of the deleted model (if and only if deletion\n * is\n successful).\n * @throws Error if deletion fails, e.g., if no model exists at `path`.\n */\n removeModel(path:\n string): Promise<ModelArtifactsInfo>;\n\n /**\n * Callback for the progress of a long-running action such as an\n HTTP\n * request for a large binary object.\n */\n * `fraction` should be a number in the [0, 1] interval, indicating\n how\n * much of the action has completed.\n */\n export type OnProgressCallback = (fraction: number) =>\n void;\n\n /**\n * @namespace io\n */\n export interface LoadOptions {\n /**\n * RequestInit (options) for HTTP\n requests.\n */\n * For detailed information on the supported fields, see\n * [https://developer.mozilla.org/en-\n US/docs/Web/API/Request/Request](\n * https://developer.mozilla.org/en-\n US/docs/Web/API/Request/Request)\n */\n requestInit?: RequestInit;\n\n /**\n * Progress callback.\n */\n onProgress?: OnProgressCallback;\n\n /**\n * A function used to override the `window.fetch` function.\n */\n fetchFunc?: Function;\n\n /**\n * Strict loading model: whether extraneous weights or missing\n * weights\n should trigger an `Error`.\n */\n * If `true`, require that the provided weights exactly match those\n * required by\n the layers. `false` means that both extra weights\n * and missing weights will be silently ignored.\n */\n * Default: `true`.\n */\n strict?: boolean;\n\n /**\n * Path prefix for weight files, by default this is calculated from\n the\n * path of the model JSON file.\n */\n * For instance, if the path to the model JSON file is\n * `http://localhost/foo/model.json`, then the default path prefix will be\n * `http://localhost/foo/`. If a weight file has\n the path value\n * `group1-shard1of2` in the weight manifest, then the weight file will be\n * loaded from

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`http://localhost/foo/group1-shard1of2` by default. However,
 * if you provide a `weightPathPrefix` value of
 * `http://localhost/foo/alt-weights`, then the weight file will be loaded
 * from the path `http://localhost/foo/alt-weights/group1-shard1of2` instead.
 *
 * weightPathPrefix?: string;
 *
 * Whether the module or model is to be loaded from TF Hub.
 *
 * Setting this to `true` allows passing a TF-Hub module URL, omitting the
 * standard model file name and the query parameters.
 *
 * Default: `false`.
 *
 * fromTFHub?: boolean;
 *
 * An async function to convert weight file name to URL. The weight file
 * names are stored in model.json's weightsManifest.paths field. By default we
 * consider weight files are colocated with the model.json file. For example:
 *
 * model.json URL: https://www.google.com/models/1/model.json
 * group1-shard1of1.bin url:
 *
 * https://www.google.com/models/1/group1-shard1of1.bin
 *
 * With this func you can convert the weight file name to any URL.
 *
 * weightUrlConverter?: (weightFileName: string) =>
Promise<string>;
 *
 * Additional options for Platform.fetch
 *
 * export interface RequestDetails {
 *
 * Is this request for a binary file (as opposed to a json file)
 *
 * isBinary?: boolean;
 *
 * }
 *
 * "use strict"
 *
 * exports.byteLength = byteLength
 *
 * exports.toByteArray = toByteArray
 *
 * exports.fromByteArray = fromByteArray
 *
 * let lookup = []
 *
 * let revLookup = []
 *
 * let Arr = typeof Uint8Array !== 'undefined' ? Uint8Array :
Array
 *
 * let code = 'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/'
 *
 * for (var i = 0, len = code.length; i < len; ++i) {
 *
 * lookup[i] = code[i]
 *
 * revLookup[code.charCodeAt(i)] = i
 *
 * }
 *
 * // Support decoding URL-safe base64 strings, as Node.js does.
 *
 * // See:
 *
 * https://en.wikipedia.org/wiki/Base64#URL_applications
 *
 * revLookup['-'.charCodeAt(0)] =
62
 *
 * revLookup['_'.charCodeAt(0)] = 63
 *
 * function getLens (b64) {
 *
 * let len = b64.length
 *
 * if (len % 4 > 0) {
 *
 * throw new Error('Invalid string. Length must be a multiple of 4')
 *
 * }
 *
 * // Trim off extra bytes after placeholder
 *
 * bytes are found
 *
 * // See: https://github.com/beatgammit/base64-js/issues/42
 *
 * let validLen = b64.indexOf('=')
 *
 * if (validLen === -1) validLen = len
 *
 * let placeHolderLen = validLen === len
 *
 * ? 0
 *
 * : 4 - (validLen % 4)
 *
 * return [validLen, placeHolderLen]
 *
 * }
 *
 * // base64 is 4/3 + up to two characters of the original data
 *
 * function byteLength (b64) {
 *
 * let lens = getLens(b64)
 *
 * let validLen = lens[0]
 *
 * let placeHolderLen = lens[1]
 *
 * return ((validLen + placeHolderLen) * 3 / 4) - placeHolderLen
 *
 * }
 *
 * function _byteLength (b64, validLen,
placeHolderLen) {
 *
 * return ((validLen + placeHolderLen) * 3 / 4) - placeHolderLen
 *
 * }
 *
 * function toByteArray (b64) {
 *
 * let tmp
 *
 * let lens = getLens(b64)
 *
 * let validLen = lens[0]
 *
 * let placeHolderLen = lens[1]
 *
 * let arr = new Arr(_byteLength(b64, validLen, placeHolderLen))
 *
 * let curByte = 0
 *
 * // if there are placeholders, only
 *
 * get up to the last complete 4 chars
 *
 * let len = placeHolderLen > 0
 *
 * ? validLen - 4
 *
 * : validLen
 *
 * for (let i = 0; i < len; i += 4) {
 *
 * tmp =
 *
 * (revLookup[b64.charCodeAt(i)] << 18) |
 *
 * (revLookup[b64.charCodeAt(i + 1)] << 12) |
 *
 * (revLookup[b64.charCodeAt(i + 2)] << 6) |
 *
 * revLookup[b64.charCodeAt(i + 3)]
 *
 * arr[curByte++] = (tmp >> 16) & 0xFF
 *
 * arr[curByte++] = (tmp >> 8) & 0xFF
 *
 * arr[curByte++] = tmp & 0xFF
 *
 * }
 *
 * if (placeHolderLen === 2) {
 *
 * tmp =
 *
 * (revLookup[b64.charCodeAt(i)] << 2) |
 *
 * (revLookup[b64.charCodeAt(i + 1)] >> 4)
 *
 * arr[curByte++] = tmp & 0xFF
 *
 * }
 *
 * if (placeHolderLen === 1) {
 *
 * tmp =
 *
 * (revLookup[b64.charCodeAt(i)] << 10) |
 *
 * (revLookup[b64.charCodeAt(i + 1)] << 4) |
 *
 * (revLookup[b64.charCodeAt(i + 2)] >> 2)
 *
 * arr[curByte++] = (tmp >> 8) & 0xFF
 *
 * arr[curByte++] = tmp & 0xFF
 *
 * }
 *
 * return arr
 *
 * }
 *
 * function tripletToBase64 (num) {
 *
 * return lookup[num >> 18 & 0x3F] +
lookup[num >> 12 & 0x3F] +
lookup[num >> 6 & 0x3F] +
lookup[num & 0x3F]
 *
 * }
 *
 * function encodeChunk (uint8, start, end) {
 *
 * let tmp
 *
 * let output = []
 *
 * for (let i = start; i < end; i += 3) {
 *
 * tmp =
 *
 * ((uint8[i] << 16) & 0xFF0000) +
 *
 * ((uint8[i + 1] << 8) & 0xFF00) +
 *
 * (uint8[i + 2] & 0xFF)
 *
 * output.push(tripletToBase64(tmp))
 *
 * }
 *
 * return output.join('')
 *
 * }
 *
 * function fromByteArray (uint8) {
 *
 * let tmp
 *
 * let len = uint8.length
 *
 * let extraBytes = len % 3 // if we have 1 byte left, pad 2 bytes
 *
 * let parts = []
 *
 * let maxChunkLength = 16383 // must be multiple of 3
 *
 * // go through the array every three bytes, we'll deal with
 *
 * trailing stuff later
 *
 * for (let i = 0, len2 = len - extraBytes; i < len2; i += maxChunkLength) {
 *
 * parts.push(encodeChunk(
uint8, i, (i + maxChunkLength) > len2 ? len2 : (i + maxChunkLength)))
 *
 * }
 *
 * // pad the end with zeros, but make sure to not forget the extra bytes
 *
 * if (extraBytes === 1) {
 *
 * tmp = uint8[len - 1]
 *
 * parts.push(
lookup[tmp >> 2] +
lookup[(tmp << 4) & 0x3F] +
'=='
)
 *
 * } else if (extraBytes === 2) {
 *
 * tmp = (uint8[len - 2] << 8) + uint8[len - 1]
 *
 * parts.push(
lookup[tmp >> 10] +
lookup[(tmp

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>> 4) & 0x3F] +\n    lookup[(tmp << 2) & 0x3F] +\n    '='\n    )\n } \n\n return parts.join('\n')\n\n", "exports.read =
function (buffer, offset, isLE, mLen, nBytes) {\n  var e, m\n  var eLen = (nBytes * 8) - mLen - 1\n  var eMax = (1
<< eLen) - 1\n  var eBias = eMax >> 1\n  var nBits = -7\n  var i = isLE ? (nBytes - 1) : 0\n  var d = isLE ? -1 : 1\n
var s = buffer[offset + i]\n  i += d\n  e = s & ((1 << (-nBits)) - 1)\n  s >>= (-nBits)\n  nBits += eLen\n  for (;
nBits > 0; e = (e * 256) + buffer[offset + i], i += d, nBits -= 8) {\n\n    m = e & ((1 << (-nBits)) - 1)\n    e >>= (-
nBits)\n    nBits += mLen\n    for (; nBits > 0; m = (m * 256) + buffer[offset + i], i += d, nBits -= 8) {\n\n      if (e ===
0) {\n        e = 1 - eBias\n      } else if (e === eMax) {\n        return m ? NaN : ((s ? -1 : 1) * Infinity)\n      } else {\n        m = m +
Math.pow(2, mLen)\n        e = e - eBias\n      }\n      return (s ? -1 : 1) * m * Math.pow(2, e - mLen)\n    }\n\n  } \n\n  exports.write =
function (buffer, value, offset, isLE, mLen, nBytes) {\n  var e, m, c\n  var eLen = (nBytes * 8) - mLen - 1\n  var
eMax = (1 << eLen) - 1\n  var eBias = eMax >> 1\n  var rt = (mLen === 23 ? Math.pow(2, -24) - Math.pow(2, -77) :
0)\n  var i = isLE ? 0 : (nBytes - 1)\n  var d = isLE ? 1 : -1\n  var s = value < 0 || (value === 0 && 1 / value < 0) ? 1 :
0\n  value = Math.abs(value)\n  if (isNaN(value) || value === Infinity) {\n    m = isNaN(value) ? 1 : 0\n    e =
eMax\n  } else {\n    e = Math.floor(Math.log(value) / Math.LN2)\n    if (value * (c = Math.pow(2, -e)) < 1) {\n      e-
\n      c *= 2\n    }\n    if (e + eBias >= 1) {\n      value += rt / c\n    } else {\n      value += rt * Math.pow(2, 1 -
eBias)\n    }\n    if (value * c >= 2) {\n      e++\n      c /= 2\n    }\n    if (e + eBias >= eMax) {\n      m = 0\n      e =
eMax\n    } else if (e + eBias >= 1) {\n      m = ((value * c) - 1) * Math.pow(2, mLen)\n      e = e + eBias\n    } else
{\n      m = value * Math.pow(2, eBias - 1) * Math.pow(2, mLen)\n      e = 0\n    }\n  }\n  for (; mLen >= 8;
buffer[offset + i] = m & 0xff, i += d, m /= 256, mLen -= 8) {\n\n    e = (e << mLen) | m\n    eLen += mLen\n    for (;
eLen > 0; buffer[offset + i] = e & 0xff, i += d, e /= 256, eLen -= 8) {\n\n      buffer[offset + i - d] |= s * 128\n    }\n  } \n\n  var
toString = {}.toString;\n\n  module.exports = Array.isArray || function (arr) {\n    return toString.call(arr) === '[object
Array]';\n  };\n\n  /**!\n   * The buffer module from node.js, for the browser.\n   *!\n   * @author Feross Aboukhadijeh
<feross@feross.org> <http://feross.org>\n   * @license MIT\n   *!\n   * eslint-disable no-proto *\n   *\n   * use strict\n   *\n   * var
base64 = require('base64-js')\n   * var ieee754 = require('ieee754')\n   * var isArray = require('isArray')\n   *\n   * exports.Buffer =
Buffer\n   * exports.SlowBuffer = SlowBuffer\n   * exports.INSPECT_MAX_BYTES = 50\n   *\n   *!\n   * If
`Buffer.TYPED_ARRAY_SUPPORT`:\n   *!\n   * === true Use Uint8Array implementation (fastest)\n   *!\n   * === false
Use Object implementation (most compatible, even IE6)\n   *!\n   * Browsers that support typed arrays are IE 10+,
Firefox 4+, Chrome 7+, Safari 5.1+,\n   *!\n   * Opera 11.6+, iOS 4.2+.\n   *!\n   * Due to various browser bugs, sometimes the
Object implementation will be used even\n   *!\n   * when the browser supports typed arrays.\n   *!\n   * Note:\n   *!\n   * -
Firefox 4-29 lacks support for adding new properties to `Uint8Array` instances,\n   *!\n   * See:
https://bugzilla.mozilla.org/show_bug.cgi?id=695438.\n   *!\n   * - Chrome 9-10 is missing the
`TypedArray.prototype.subarray` function.\n   *!\n   * - IE10 has a broken `TypedArray.prototype.subarray` function
which returns arrays of\n   *!\n   * incorrect length in some situations.\n   *\n   * We detect these buggy browsers and set
`Buffer.TYPED_ARRAY_SUPPORT` to `false` so they\n   *!\n   * get the Object implementation, which is slower but
behaves correctly.\n   *!\n   *!\n   * Buffer.TYPED_ARRAY_SUPPORT = global.TYPED_ARRAY_SUPPORT !==
undefined\n   * ? global.TYPED_ARRAY_SUPPORT\n   * : typedArraySupport()\n   *\n   *!\n   * Export kMaxLength after
typed array support is determined.\n   *!\n   *!\n   * exports.kMaxLength = kMaxLength()\n   *\n   *!\n   * function typedArraySupport ()
{\n   *!\n   * try {\n   *!\n   * var arr = new Uint8Array(1)\n   *!\n   * arr.__proto__ = {__proto__: Uint8Array.prototype, foo: function () {\n   *!\n   * return 42 }}\n   *!\n   * return arr.foo() === 42 && // typed array instances can be augmented\n   *!\n   * typeof arr.subarray
=== 'function' && // chrome 9-10 lack `subarray`\n   *!\n   * arr.subarray(1, 1).byteLength === 0 // ie10 has broken
`subarray`\n   *!\n   * } catch (e) {\n   *!\n   * return false\n   *!\n   * }\n   *!\n   * }\n   *\n   *!\n   * function kMaxLength () {\n   *!\n   * return
Buffer.TYPED_ARRAY_SUPPORT\n   * ? 0x7fffffff\n   * : 0x3fffffff\n   * }\n   *\n   *!\n   * function createBuffer (that, length) {\n   *!\n   * if (kMaxLength() < length) {\n   *!\n   * throw new RangeError('Invalid typed array length')\n   *!\n   * }\n   *!\n   * if
(Buffer.TYPED_ARRAY_SUPPORT) {\n   *!\n   * // Return an augmented `Uint8Array` instance, for best performance\n   *!\n   * that = new Uint8Array(length)\n   *!\n   * that.__proto__ = Buffer.prototype\n   *!\n   * } else {\n   *!\n   * // Fallback: Return an object
instance of the Buffer class\n   *!\n   * if (that === null) {\n   *!\n   * that = new Buffer(length)\n   *!\n   * }\n   *!\n   * that.length = length\n   *!\n   * }\n   *!\n   * return that\n   *!\n   * }\n   *\n   *!\n   *!\n   *!\n   * The Buffer constructor returns instances of `Uint8Array` that have their\n   *!\n   * prototype changed to `Buffer.prototype`. Furthermore, `Buffer` is a subclass of\n   *!\n   * `Uint8Array`, so the returned
instances will have all the node `Buffer` methods\n   *!\n   * and the `Uint8Array` methods. Square bracket notation works

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as expected -- it\n * returns a single octet.\n *\n * The `Uint8Array` prototype remains unmodified.\n *\n\nfunction
Buffer(arg, encodingOrOffset, length) {\n  if (!Buffer.TYPED_ARRAY_SUPPORT && !(this instanceof Buffer))
{\n    return new Buffer(arg, encodingOrOffset, length)\n  }\n\n  // Common case.\n  if (typeof arg === 'number') {\n
if (typeof encodingOrOffset === 'string') {\n    throw new Error(\n      'If encoding is specified then the first
argument must be a string'\n    )\n  }\n  return allocUnsafe(this, arg)\n }\n return from(this, arg,
encodingOrOffset, length)\n}\n\nBuffer.poolSize = 8192 // not used by this implementation\n\n// TODO: Legacy,
not needed anymore. Remove in next major version.\nBuffer._augment = function (arr) {\n  arr.__proto__ =
Buffer.prototype\n  return arr\n}\n\nfunction from (that, value, encodingOrOffset, length) {\n  if (typeof value ===
'number') {\n    throw new TypeError("\value" argument must not be a number')\n  }\n  if (typeof ArrayBuffer
!== 'undefined' && value instanceof ArrayBuffer) {\n    return fromArrayBuffer(that, value, encodingOrOffset,
length)\n  }\n  if (typeof value === 'string') {\n    return fromString(that, value, encodingOrOffset)\n  }\n  return
fromObject(that, value)\n}\n\n/**\n * Functionally equivalent to Buffer(arg, encoding) but throws a TypeError\n * if
value is a number.\n * Buffer.from(str[, encoding])\n * Buffer.from(array)\n * Buffer.from(buffer)\n *
Buffer.from(arrayBuffer[, byteOffset[, length]])\n */\n\nBuffer.from = function (value, encodingOrOffset, length) {\n
return from(null, value, encodingOrOffset, length)\n}\n\nif (Buffer.TYPED_ARRAY_SUPPORT) {\n
Buffer.prototype.__proto__ = Uint8Array.prototype\n  Buffer.__proto__ = Uint8Array\n  if (typeof Symbol !==
'undefined' && Symbol.species &&\n    Buffer[Symbol.species] === Buffer) {\n    // Fix subarray() in ES2016.
See: https://github.com/feross/buffer/pull/97\n    Object.defineProperty(Buffer, Symbol.species, {\n      value: null,\n
configurable: true\n    })\n  }\n}\n\nfunction assertSize (size) {\n  if (typeof size !== 'number') {\n    throw new
TypeError("\size" argument must be a number')\n  } else if (size < 0) {\n    throw new RangeError("\size"
argument must not be negative')\n  }\n}\n\nfunction alloc (that, size, fill, encoding) {\n  assertSize(size)\n  if (size
<= 0) {\n    return createBuffer(that, size)\n  }\n  if (fill !== undefined) {\n    // Only pay attention to encoding if it's
a string. This\n    // prevents accidentally sending in a number that would\n    // be interpreted as a start offset.\n
return typeof encoding === 'string'\n      ? createBuffer(that, size).fill(fill, encoding)\n      : createBuffer(that,
size).fill(fill)\n  }\n  return createBuffer(that, size)\n}\n\n/**\n * Creates a new filled Buffer instance.\n * alloc(size[,
fill[, encoding]])\n */\n\nBuffer.alloc = function (size, fill, encoding) {\n  return alloc(null, size, fill,
encoding)\n}\n\nfunction allocUnsafe (that, size) {\n  assertSize(size)\n  that = createBuffer(that, size < 0 ? 0 :
checked(size) | 0)\n  if (!Buffer.TYPED_ARRAY_SUPPORT) {\n    for (var i = 0; i < size; ++i) {\n      that[i] = 0\n
}\n  }\n  return that\n}\n\n/**\n * Equivalent to Buffer(num), by default creates a non-zero-filled Buffer instance.\n
*\n */\n\nBuffer.allocUnsafe = function (size) {\n  return allocUnsafe(null, size)\n}\n\n/**\n * Equivalent to
SlowBuffer(num), by default creates a non-zero-filled Buffer instance.\n *\n */\n\nBuffer.allocUnsafeSlow = function
(size) {\n  return allocUnsafe(null, size)\n}\n\nfunction fromString (that, string, encoding) {\n  if (typeof encoding
!== 'string' || encoding === '') {\n    encoding = 'utf8'\n  }\n  if (!Buffer.isEncoding(encoding)) {\n    throw new
TypeError("\encoding" must be a valid string encoding')\n  }\n  var length = byteLength(string, encoding) | 0\n
that = createBuffer(that, length)\n  var actual = that.write(string, encoding)\n  if (actual !== length) {\n    //
Writing a hex string, for example, that contains invalid characters will\n    // cause everything after the first invalid
character to be ignored. (e.g.\n    // 'abxcd' will be treated as 'ab')\n    that = that.slice(0, actual)\n  }\n  return
that\n}\n\nfunction fromArrayLike (that, array) {\n  var length = array.length < 0 ? 0 : checked(array.length) | 0\n
that = createBuffer(that, length)\n  for (var i = 0; i < length; i += 1) {\n    that[i] = array[i] & 255\n  }\n  return
that\n}\n\nfunction fromArrayBuffer (that, array, byteOffset, length) {\n  array.byteLength // this throws if `array` is
not a valid ArrayBuffer\n\n  if (byteOffset < 0 || array.byteLength < byteOffset) {\n    throw new
RangeError("\offset" is out of bounds')\n  }\n  if (array.byteLength < byteOffset + (length || 0)) {\n    throw new
RangeError("\length" is out of bounds')\n  }\n  if (byteOffset === undefined && length === undefined) {\n
array = new Uint8Array(array)\n  } else if (length === undefined) {\n    array = new Uint8Array(array, byteOffset)\n
  } else {\n    array = new Uint8Array(array, byteOffset, length)\n  }\n  if (Buffer.TYPED_ARRAY_SUPPORT) {\n
// Return an augmented `Uint8Array` instance, for best performance\n    that = array\n    that.__proto__ =
Buffer.prototype\n  } else {\n    // Fallback: Return an object instance of the Buffer class\n    that =
fromArrayLike(that, array)\n  }\n  return that\n}\n\nfunction fromObject (that, obj) {\n  if (Buffer.isBuffer(obj)) {\n

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var len = checked(obj.length) | 0\n  that = createBuffer(that, len)\n\n  if (that.length === 0) {\n    return that\n  }\n\n  obj.copy(that, 0, 0, len)\n  return that\n }\n\n if (obj) {\n   if ((typeof ArrayBuffer !== 'undefined' &&\n     obj.buffer instanceof ArrayBuffer) || 'length' in obj) {\n     if (typeof obj.length !== 'number' || isnan(obj.length))\n     {\n       return createBuffer(that, 0)\n     }\n     return fromArrayLike(that, obj)\n   }\n\n   if (obj.type === 'Buffer'\n     && isArray(obj.data)) {\n     return fromArrayLike(that, obj.data)\n   }\n\n   throw new TypeError('First\nargument must be a string, Buffer, ArrayBuffer, Array, or array-like object.')

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buffer` (in Safari 5-7) to detect\n// Buffer instances.\n\nBuffer.prototype._isBuffer = true\n\nfunction swap (b, n, m)
{\n  var i = b[n]\n  b[n] = b[m]\n  b[m] = i\n}\n\nBuffer.prototype.swap16 = function swap16 () {\n  var len =
this.length\n  if (len % 2 !== 0) {\n    throw new RangeError('Buffer size must be a multiple of 16-bits')\n  }\n  for
(var i = 0; i < len; i += 2) {\n    swap(this, i, i + 1)\n  }\n  return this\n}\n\nBuffer.prototype.swap32 = function
swap32 () {\n  var len = this.length\n  if (len % 4 !== 0) {\n    throw new RangeError('Buffer size must be a multiple
of 32-bits')\n  }\n  for (var i = 0; i < len; i += 4) {\n    swap(this, i, i + 3)\n    swap(this, i + 1, i + 2)\n  }\n  return
this\n}\n\nBuffer.prototype.swap64 = function swap64 () {\n  var len = this.length\n  if (len % 8 !== 0) {\n    throw
new RangeError('Buffer size must be a multiple of 64-bits')\n  }\n  for (var i = 0; i < len; i += 8) {\n    swap(this, i,
i + 7)\n    swap(this, i + 1, i + 6)\n    swap(this, i + 2, i + 5)\n    swap(this, i + 3, i + 4)\n  }\n  return
this\n}\n\nBuffer.prototype.toString = function toString () {\n  var length = this.length | 0\n  if (length === 0) return
''\n  if (arguments.length === 0) return utf8Slice(this, 0, length)\n  return slowToString.apply(this,
arguments)\n}\n\nBuffer.prototype.equals = function equals (b) {\n  if (!Buffer.isBuffer(b)) throw new
TypeError('Argument must be a Buffer')\n  if (this === b) return true\n  return Buffer.compare(this, b) ===
0\n}\n\nBuffer.prototype.inspect = function inspect () {\n  var str = ''\n  var max =
exports.INSPECT_MAX_BYTES\n  if (this.length > 0) {\n    str = this.toString('hex', 0, max).match(/.{2}/g).join('
')\n    if (this.length > max) str += ' ... '\n  }\n  return '<Buffer ' + str + '>'\n}\n\nBuffer.prototype.compare = function
compare (target, start, end, thisStart, thisEnd) {\n  if (!Buffer.isBuffer(target)) {\n    throw new
TypeError('Argument must be a Buffer')\n  }\n  if (start === undefined) {\n    start = 0\n  }\n  if (end ===
undefined) {\n    end = target ? target.length : 0\n  }\n  if (thisStart === undefined) {\n    thisStart = 0\n  }\n  if
(thisEnd === undefined) {\n    thisEnd = this.length\n  }\n  if (start < 0 || end > target.length || thisStart < 0 ||
thisEnd > this.length) {\n    throw new RangeError('out of range index')\n  }\n  if (thisStart >= thisEnd && start
>= end) {\n    return 0\n  }\n  if (thisStart >= thisEnd) {\n    return -1\n  }\n  if (start >= end) {\n    return 1\n  }\n  if
(start >>>= 0\n  end >>>= 0\n  thisStart >>>= 0\n  thisEnd >>>= 0)\n  if (this === target) return 0\n  var x =
thisEnd - thisStart\n  var y = end - start\n  var len = Math.min(x, y)\n  var thisCopy = this.slice(thisStart,
thisEnd)\n  var targetCopy = target.slice(start, end)\n  for (var i = 0; i < len; ++i) {\n    if (thisCopy[i] !==
targetCopy[i]) {\n      x = thisCopy[i]\n      y = targetCopy[i]\n      break\n    }\n  }\n  if (x < y) return -1\n  if (y <
x) return 1\n  return 0\n}\n\n// Finds either the first index of `val` in `buffer` at offset >= `byteOffset`,\n// OR the last
index of `val` in `buffer` at offset <= `byteOffset`.\n\n// Arguments:\n// - buffer - a Buffer to search\n// - val - a
string, Buffer, or number\n// - byteOffset - an index into `buffer`; will be clamped to an int32\n// - encoding - an
optional encoding, relevant is val is a string\n// - dir - true for indexOf, false for lastIndexOf\n\nfunction
bidirectionalIndexOf (buffer, val, byteOffset, encoding, dir) {\n  // Empty buffer means no match\n  if (buffer.length
=== 0) return -1\n  // Normalize byteOffset\n  if (typeof byteOffset === 'string') {\n    encoding = byteOffset\n    byteOffset = 0\n  } else if (byteOffset > 0x7fffffff) {\n    byteOffset = 0x7fffffff\n  } else if (byteOffset < -
0x80000000) {\n    byteOffset = -0x80000000\n  }\n  byteOffset = +byteOffset // Coerce to Number.\n  if
(isNaN(byteOffset)) {\n    // byteOffset: it's undefined, null, NaN, "foo", etc, search whole buffer\n    byteOffset
= dir ? 0 : (buffer.length - 1)\n  }\n  // Normalize byteOffset: negative offsets start from the end of the buffer\n  if
(byteOffset < 0) byteOffset = buffer.length + byteOffset\n  if (byteOffset >= buffer.length) {\n    if (dir) return -1\n
else byteOffset = buffer.length - 1\n  } else if (byteOffset < 0) {\n    if (dir) byteOffset = 0\n    else return -1\n  }\n  // Normalize val\n  if (typeof val === 'string') {\n    val = Buffer.from(val, encoding)\n  }\n  // Finally, search
either indexOf (if dir is true) or lastIndexOf\n  if (Buffer.isBuffer(val)) {\n    // Special case: looking for empty
string/buffer always fails\n    if (val.length === 0) {\n      return -1\n    }\n    return arrayIndexOf(buffer, val,
byteOffset, encoding, dir)\n  } else if (typeof val === 'number') {\n    val = val & 0xFF // Search for a byte value [0-
255]\n    if (Buffer.TYPED_ARRAY_SUPPORT &&\n      typeof Uint8Array.prototype.indexOf === 'function')\n    {\n      if (dir) {\n        return Uint8Array.prototype.indexOf.call(buffer, val, byteOffset)\n      } else {\n        return
Uint8Array.prototype.lastIndexOf.call(buffer, val, byteOffset)\n      }\n    }\n    return arrayIndexOf(buffer, [ val ],
byteOffset, encoding, dir)\n  }\n  throw new TypeError('val must be string, number or Buffer')\n}\n\nfunction
arrayIndexOf (arr, val, byteOffset, encoding, dir) {\n  var indexSize = 1\n  var arrLength = arr.length\n  var
valLength = val.length\n  if (encoding !== undefined) {\n    encoding = String(encoding).toLowerCase()\n    if

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(encoding === 'ucs2' || encoding === 'ucs-2' || encoding === 'utf16le' || encoding === 'utf-16le') {\n  if
(arr.length < 2 || val.length < 2) {\n    return -1\n  }\n  indexSize = 2\n  arrLength /= 2\n  valLength /=
2\n  byteOffset /= 2\n  }\n }\n\n function read (buf, i) {\n  if (indexSize === 1) {\n    return buf[i]\n  } else
{\n    return buf.readUInt16BE(i * indexSize)\n  }\n }\n\n var i\n if (dir) {\n  var foundIndex = -1\n  for (i =
byteOffset; i < arrLength; i++) {\n    if (read(arr, i) === read(val, foundIndex === -1 ? 0 : i - foundIndex)) {\n
if (foundIndex === -1) foundIndex = i\n    if (i - foundIndex + 1 === valLength) return foundIndex * indexSize\n
  } else {\n    if (foundIndex !== -1) i -= i - foundIndex\n    foundIndex = -1\n  }\n }\n } else {\n  if
(byteOffset + valLength > arrLength) byteOffset = arrLength - valLength\n  for (i = byteOffset; i >= 0; i--) {\n
var found = true\n  for (var j = 0; j < valLength; j++) {\n    if (read(arr, i + j) !== read(val, j)) {\n      found =
false\n      break\n    }\n  }\n  if (found) return i\n }\n }\n\n return -1\n }\n\nBuffer.prototype.includes =
function includes (val, byteOffset, encoding) {\n  return this.indexOf(val, byteOffset, encoding) !== -
1\n }\n\nBuffer.prototype.indexOf = function indexOf (val, byteOffset, encoding) {\n  return
bidirectionalIndexOf(this, val, byteOffset, encoding, true)\n }\n\nBuffer.prototype.lastIndexOf = function
lastIndexOf (val, byteOffset, encoding) {\n  return bidirectionalIndexOf(this, val, byteOffset, encoding,
false)\n }\n\nfunction hexWrite (buf, string, offset, length) {\n  offset = Number(offset) || 0\n  var remaining =
buf.length - offset\n  if (!length) {\n    length = remaining\n  } else {\n    length = Number(length)\n    if (length >
remaining) {\n      length = remaining\n    }\n  }\n  // must be an even number of digits\n  var strLen =
string.length\n  if (strLen % 2 !== 0) throw new TypeError('Invalid hex string')\n  if (length > strLen / 2) {\n
length = strLen / 2\n  }\n  for (var i = 0; i < length; ++i) {\n    var parsed = parseInt(string.substr(i * 2, 2), 16)\n    if
(isNaN(parsed)) return i\n    buf[offset + i] = parsed\n  }\n  return i\n }\n\nfunction utf8Write (buf, string, offset,
length) {\n  return blitBuffer(utf8ToBytes(string), buf, offset, length)\n }\n\nfunction asciiWrite
(buf, string, offset, length) {\n  return blitBuffer(asciiToBytes(string), buf, offset, length)\n }\n\nfunction latin1Write
(buf, string, offset, length) {\n  return asciiWrite(buf, string, offset, length)\n }\n\nfunction base64Write (buf, string,
offset, length) {\n  return blitBuffer(base64ToBytes(string), buf, offset, length)\n }\n\nfunction ucs2Write (buf,
string, offset, length) {\n  return blitBuffer(utf16leToBytes(string), buf, offset,
length)\n }\n\nBuffer.prototype.write = function write (string, offset, length, encoding) {\n  // Buffer#write(string)\n
if (offset === undefined) {\n    encoding = 'utf8'\n    length = this.length\n    offset = 0\n  // Buffer#write(string,
encoding)\n  } else if (length === undefined && typeof offset === 'string') {\n    encoding = offset\n    length =
this.length\n    offset = 0\n  // Buffer#write(string, offset[, length][, encoding])\n  } else if (isFinite(offset)) {\n
offset = offset | 0\n    if (isFinite(length)) {\n      length = length | 0\n      if (encoding === undefined) encoding =
'utf8'\n    } else {\n      encoding = length\n      length = undefined\n    }\n  // legacy write(string, encoding, offset,
length) - remove in v0.13\n  } else {\n    throw new Error(\n    'Buffer.write(string, encoding, offset[, length]) is no
longer supported'\n  )\n }\n\n  var remaining = this.length - offset\n  if (length === undefined || length >
remaining) length = remaining\n  if ((string.length > 0 && (length < 0 || offset < 0)) || offset > this.length) {\n
throw new RangeError('Attempt to write outside buffer bounds')\n }\n\n  if (!encoding) encoding = 'utf8'\n\n  var
loweredCase = false\n  for (;;) {\n    switch (encoding) {\n      case 'hex':\n        return hexWrite(this, string, offset,
length)\n      case 'utf8':\n      case 'utf-8':\n        return utf8Write(this, string, offset, length)\n      case 'ascii':\n        return
asciiWrite(this, string, offset, length)\n      case 'latin1':\n      case 'binary':\n        return latin1Write(this,
string, offset, length)\n      case 'base64':\n        // Warning: maxLength not taken into account in base64Write\n
return base64Write(this, string, offset, length)\n      case 'ucs2':\n      case 'ucs-2':\n      case 'utf16le':\n      case 'utf-
16le':\n        return ucs2Write(this, string, offset, length)\n      default:\n        if (loweredCase) throw new
TypeError('Unknown encoding: ' + encoding)\n        encoding = (' + encoding).toLowerCase()\n        loweredCase =
true\n    }\n  }\n }\n }\n\nBuffer.prototype.toJSON = function toJSON () {\n  return {\n    type: 'Buffer',\n    data:
Array.prototype.slice.call(this._arr || this, 0)\n  }\n }\n\nfunction base64Slice (buf, start, end) {\n  if (start === 0 &&
end === buf.length) {\n    return base64.fromByteArray(buf)\n  } else {\n    return
base64.fromByteArray(buf.slice(start, end))\n  }\n }\n\nfunction utf8Slice (buf, start, end) {\n  end =
Math.min(buf.length, end)\n  var res = []\n  var i = start\n  while (i < end) {\n    var firstByte = buf[i]\n    var
codePoint = null\n    var bytesPerSequence = (firstByte > 0xEF) ? 4\n      : (firstByte > 0xDF) ? 3\n      : (firstByte >

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0xBF) ? 2\n    : 1\n\n    if (i + bytesPerSequence <= end) {\n        var secondByte, thirdByte, fourthByte,
tempCodePoint\n\n        switch (bytesPerSequence) {\n            case 1:\n                if (firstByte < 0x80) {\n                    codePoint
= firstByte\n                }\n                break\n            case 2:\n                secondByte = buf[i + 1]\n                if ((secondByte & 0xC0)
=== 0x80) {\n                    tempCodePoint = (firstByte & 0x1F) << 0x6 | (secondByte & 0x3F)\n                    if
(tempCodePoint > 0x7F) {\n                        codePoint = tempCodePoint\n                    }\n                }\n                break\n            case 3:\n                secondByte = buf[i + 1]\n                thirdByte = buf[i + 2]\n                if ((secondByte & 0xC0) === 0x80 && (thirdByte
& 0xC0) === 0x80) {\n                    tempCodePoint = (firstByte & 0xF) << 0xC | (secondByte & 0x3F) << 0x6 |
(thirdByte & 0x3F)\n                    if (tempCodePoint > 0x7FF && (tempCodePoint < 0xD800 || tempCodePoint >
0xDFFF)) {\n                        codePoint = tempCodePoint\n                    }\n                }\n                break\n            case 4:\n                secondByte = buf[i + 1]\n                thirdByte = buf[i + 2]\n                fourthByte = buf[i + 3]\n                if ((secondByte &
0xC0) === 0x80 && (thirdByte & 0xC0) === 0x80 && (fourthByte & 0xC0) === 0x80) {\n                    tempCodePoint
= (firstByte & 0xF) << 0x12 | (secondByte & 0x3F) << 0xC | (thirdByte & 0x3F) << 0x6 | (fourthByte & 0x3F)\n                    if
(tempCodePoint > 0xFFFF && tempCodePoint < 0x110000) {\n                        codePoint = tempCodePoint\n                    }\n                }\n                }\n                }\n                }\n                if (codePoint === null) {\n                    // we did not generate a valid codePoint so insert a\n
// replacement char (U+FFFD) and advance only 1 byte\n                    codePoint = 0xFFFF\n                    bytesPerSequence = 1\n                }\n            else if (codePoint > 0xFFFF) {\n                // encode to utf16 (surrogate pair dance)\n                codePoint -= 0x10000\n
res.push(codePoint >>> 10 & 0x3FF | 0xD800)\n                codePoint = 0xDC00 | codePoint & 0x3FF\n            }\n            res.push(codePoint)\n            i += bytesPerSequence\n        }\n        return decodeCodePointsArray(res)\n    }\n\n    // Based on
http://stackoverflow.com/a/22747272/680742, the browser with\n    // the lowest limit is Chrome, with 0x10000
args.\n    // We go 1 magnitude less, for safety\n    var MAX_ARGUMENTS_LENGTH = 0x1000\n\n    function
decodeCodePointsArray (codePoints) {\n        var len = codePoints.length\n        if (len <=
MAX_ARGUMENTS_LENGTH) {\n            return String.fromCharCode.apply(String, codePoints) // avoid extra
slice()\n        }\n        // Decode in chunks to avoid \"call stack size exceeded\"\n        var res = \"\n        var i = 0\n        while (i < len)
{\n            res += String.fromCharCode.apply(\n                String,\n                codePoints.slice(i, i +=
MAX_ARGUMENTS_LENGTH)\n            )\n        }\n        return res\n    }\n\n    function asciiSlice (buf, start, end) {\n        var ret = \"\n        end = Math.min(buf.length, end)\n        for (var i = start; i < end; ++i) {\n            ret += String.fromCharCode(buf[i] &
0x7F)\n        }\n        return ret\n    }\n\n    function latin1Slice (buf, start, end) {\n        var ret = \"\n        end = Math.min(buf.length,
end)\n        for (var i = start; i < end; ++i) {\n            ret += String.fromCharCode(buf[i])\n        }\n        return ret\n    }\n\n    function
hexSlice (buf, start, end) {\n        var len = buf.length\n        if (!start || start < 0) start = 0\n        if (!end || end < 0 || end > len)
end = len\n        var out = \"\n        for (var i = start; i < end; ++i) {\n            out += toHex(buf[i])\n        }\n        return
out\n    }\n\n    function utf16leSlice (buf, start, end) {\n        var bytes = buf.slice(start, end)\n        var res = \"\n        for (var i = 0; i <
bytes.length; i += 2) {\n            res += String.fromCharCode(bytes[i] + bytes[i + 1] * 256)\n        }\n        return
res\n    }\n\n    Buffer.prototype.slice = function slice (start, end) {\n        var len = this.length\n        start = ~~start\n        end = end
=== undefined ? len : ~~end\n        if (start < 0) {\n            start += len\n            if (start < 0) start = 0\n        } else if (start > len) {\n
start = len\n        }\n        if (end < 0) {\n            end += len\n            if (end < 0) end = 0\n        } else if (end > len) {\n            end = len\n
        }\n        if (end < start) end = start\n        var newBuf\n        if (Buffer.TYPED_ARRAY_SUPPORT) {\n            newBuf =
this.subarray(start, end)\n            newBuf.__proto__ = Buffer.prototype\n        } else {\n            var sliceLen = end - start\n            newBuf = new Buffer(sliceLen, undefined)\n            for (var i = 0; i < sliceLen; ++i) {\n                newBuf[i] = this[i + start]\n            }\n        }\n        return newBuf\n    }\n\n    // Need to make sure that buffer isn't trying to write out of bounds.\n
*/\n    function checkOffset (offset, ext, length) {\n        if ((offset % 1) !== 0 || offset < 0) throw new RangeError('offset is
not uint')\n        if (offset + ext > length) throw new RangeError('Trying to access beyond buffer
length')\n    }\n\n    Buffer.prototype.readUIntLE = function readUIntLE (offset, byteLength, noAssert) {\n        offset =
offset | 0\n        byteLength = byteLength | 0\n        if (!noAssert) checkOffset(offset, byteLength, this.length)\n        var val =
this[offset]\n        var mul = 1\n        var i = 0\n        while (++i < byteLength && (mul *= 0x100)) {\n            val += this[offset + i] *
mul\n        }\n        return val\n    }\n\n    Buffer.prototype.readUIntBE = function readUIntBE (offset, byteLength, noAssert)
{\n        offset = offset | 0\n        byteLength = byteLength | 0\n        if (!noAssert) {\n            checkOffset(offset, byteLength,
this.length)\n        }\n        var val = this[offset + --byteLength]\n        var mul = 1\n        while (byteLength > 0 && (mul *=
0x100)) {\n            val += this[offset + --byteLength] * mul\n        }\n        return val\n    }\n\n    Buffer.prototype.readUInt8 =

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function readUInt8 (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 1, this.length)
  return this[offset]
}
Buffer.prototype.readUInt16LE = function readUInt16LE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 2, this.length)
  return this[offset] | (this[offset + 1] << 8)
}
Buffer.prototype.readUInt16BE = function readUInt16BE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 2, this.length)
  return (this[offset] << 8) | this[offset + 1]
}
Buffer.prototype.readUInt32LE = function readUInt32LE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 4, this.length)
  return ((this[offset]) | (this[offset + 1] << 8) | (this[offset + 2] << 16)) + (this[offset + 3] * 0x1000000)
}
Buffer.prototype.readUInt32BE = function readUInt32BE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 4, this.length)
  return (this[offset] * 0x1000000) + ((this[offset + 1] << 16) | (this[offset + 2] << 8) | this[offset + 3])
}
Buffer.prototype.readIntLE = function readIntLE (offset,
byteLength, noAssert) {
  offset = offset | 0
  byteLength = byteLength | 0
  if (!noAssert) checkOffset(offset,
byteLength, this.length)
  var val = this[offset]
  var mul = 1
  var i = 0
  while (++i < byteLength && (mul *= 0x100)) {
    val += this[offset + i] * mul
  }
  mul *= 0x80
  if (val >= mul) val -= Math.pow(2, 8 * byteLength)
  return val
}
Buffer.prototype.readIntBE = function readIntBE (offset, byteLength, noAssert) {
  offset = offset | 0
  byteLength = byteLength | 0
  if (!noAssert) checkOffset(offset, byteLength,
this.length)
  var i = byteLength
  var mul = 1
  var val = this[offset + --i]
  while (i > 0 && (mul *= 0x100)) {
    val += this[offset + --i] * mul
  }
  mul *= 0x80
  if (val >= mul) val -= Math.pow(2, 8 * byteLength)
  return val
}
Buffer.prototype.readInt8 = function readInt8 (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 1, this.length)
  if (!(this[offset] & 0x80)) return (this[offset])
  return ((0xff - this[offset] + 1) * -1)
}
Buffer.prototype.readInt16LE = function readInt16LE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 2, this.length)
  var val = this[offset] | (this[offset + 1] << 8)
  return (val & 0x8000) ? val | 0xFFFF0000 : val
}
Buffer.prototype.readInt16BE = function readInt16BE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 2, this.length)
  var val = this[offset + 1] | (this[offset] << 8)
  return (val & 0x8000) ? val | 0xFFFF0000 : val
}
Buffer.prototype.readInt32LE = function readInt32LE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 4, this.length)
  return (this[offset]) | (this[offset + 1] << 8) | (this[offset + 2] << 16) | (this[offset + 3] << 24)
}
Buffer.prototype.readInt32BE = function readInt32BE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 4, this.length)
  return (this[offset] << 24) | (this[offset + 1] << 16) | (this[offset + 2] << 8) | (this[offset + 3])
}
Buffer.prototype.readFloatLE = function readFloatLE (offset,
noAssert) {
  if (!noAssert) checkOffset(offset, 4, this.length)
  return ieee754.read(this, offset, true, 23, 4)
}
Buffer.prototype.readFloatBE = function readFloatBE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 4, this.length)
  return ieee754.read(this, offset, false, 23, 4)
}
Buffer.prototype.readDoubleLE = function readDoubleLE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 8, this.length)
  return ieee754.read(this, offset, true, 52, 8)
}
Buffer.prototype.readDoubleBE = function readDoubleBE (offset, noAssert) {
  if (!noAssert) checkOffset(offset, 8, this.length)
  return ieee754.read(this, offset, false, 52, 8)
}
function checkInt (buf,
value, offset, ext, max, min) {
  if (!Buffer.isBuffer(buf)) throw new TypeError('"buffer" argument must be a Buffer instance')
  if (value > max || value < min) throw new RangeError('"value" argument is out of bounds')
  if (offset + ext > buf.length) throw new RangeError('Index out of range')
}
Buffer.prototype.writeUIntLE = function writeUIntLE (value, offset, byteLength, noAssert) {
  value = +value
  offset = offset | 0
  byteLength = byteLength | 0
  if (!noAssert) {
    var maxBytes = Math.pow(2, 8 * byteLength) - 1
    checkInt(this, value, offset, byteLength, maxBytes, 0)
  }
  var mul = 1
  var i = 0
  this[offset] = value & 0xFF
  while (++i < byteLength && (mul *= 0x100)) {
    this[offset + i] = (value / mul) & 0xFF
  }
  return offset + byteLength
}
Buffer.prototype.writeUIntBE = function writeUIntBE (value, offset, byteLength, noAssert) {
  value = +value
  offset = offset | 0
  byteLength = byteLength | 0
  if (!noAssert) {
    var maxBytes = Math.pow(2, 8 * byteLength) - 1
    checkInt(this, value, offset, byteLength, maxBytes, 0)
  }
  var i = byteLength - 1
  var mul = 1
  this[offset + i] = value & 0xFF
  while (--i >= 0 && (mul *= 0x100)) {
    this[offset + i] = (value / mul) & 0xFF
  }
  return offset + byteLength
}
Buffer.prototype.writeUInt8 = function writeUInt8 (value, offset, noAssert) {
  value = +value
  offset = offset | 0
  if (!noAssert) checkInt(this,

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value, offset, 1, 0xff, 0)\n if (!Buffer.TYPED_ARRAY_SUPPORT) value = Math.floor(value)\n this[offset] =
(value & 0xff)\n return offset + 1\n}\n\nfunction objectWriteUInt16 (buf, value, offset, littleEndian) {\n if (value <
0) value = 0xffff + value + 1\n for (var i = 0, j = Math.min(buf.length - offset, 2); i < j; ++i) {\n buf[offset + i] =
(value & (0xff << (8 * (littleEndian ? i : 1 - i)))) >>>\n (littleEndian ? i : 1 - i) * 8\n
}\n}\n\nBuffer.prototype.writeUInt16LE = function writeUInt16LE (value, offset, noAssert) {\n value = +value\n
offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0xffff, 0)\n if
(Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value & 0xff)\n this[offset + 1] = (value >>> 8)\n }
else {\n objectWriteUInt16(this, value, offset, true)\n }\n return offset + 2\n}\n\nBuffer.prototype.writeUInt16BE
= function writeUInt16BE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert)
checkInt(this, value, offset, 2, 0xffff, 0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>>
8)\n this[offset + 1] = (value & 0xff)\n } else {\n objectWriteUInt16(this, value, offset, false)\n }\n return
offset + 2\n}\n\nfunction objectWriteUInt32 (buf, value, offset, littleEndian) {\n if (value < 0) value = 0xffffffff +
value + 1\n for (var i = 0, j = Math.min(buf.length - offset, 4); i < j; ++i) {\n buf[offset + i] = (value >>>
(littleEndian ? i : 3 - i) * 8) & 0xff\n }\n}\n\nBuffer.prototype.writeUInt32LE = function writeUInt32LE (value,
offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0xffffffff,
0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset + 3] = (value >>> 24)\n this[offset + 2] = (value
>>> 16)\n this[offset + 1] = (value >>> 8)\n this[offset] = (value & 0xff)\n } else {\n objectWriteUInt32(this,
value, offset, true)\n }\n return offset + 4\n}\n\nBuffer.prototype.writeUInt32BE = function writeUInt32BE (value,
offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0xffffffff,
0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>> 24)\n this[offset + 1] = (value >>>
16)\n this[offset + 2] = (value >>> 8)\n this[offset + 3] = (value & 0xff)\n } else {\n objectWriteUInt32(this,
value, offset, false)\n }\n return offset + 4\n}\n\nBuffer.prototype.writeIntLE = function writeIntLE (value, offset,
byteLength, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) {\n var limit = Math.pow(2, 8 *
byteLength - 1)\n\n checkInt(this, value, offset, byteLength, limit - 1, -limit)\n }\n\n var i = 0\n var mul = 1\n
var sub = 0\n this[offset] = value & 0xFF\n while (++i < byteLength && (mul *= 0x100)) {\n if (value < 0 &&
sub === 0 && this[offset + i - 1] !== 0) {\n sub = 1\n }\n this[offset + i] = ((value / mul) >> 0) - sub &
0xFF\n }\n\n return offset + byteLength\n}\n\nBuffer.prototype.writeIntBE = function writeIntBE (value, offset,
byteLength, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) {\n var limit = Math.pow(2, 8 *
byteLength - 1)\n\n checkInt(this, value, offset, byteLength, limit - 1, -limit)\n }\n\n var i = byteLength - 1\n var
mul = 1\n var sub = 0\n this[offset + i] = value & 0xFF\n while (--i >= 0 && (mul *= 0x100)) {\n if (value < 0
&& sub === 0 && this[offset + i + 1] !== 0) {\n sub = 1\n }\n this[offset + i] = ((value / mul) >> 0) - sub &
0xFF\n }\n\n return offset + byteLength\n}\n\nBuffer.prototype.writeInt8 = function writeInt8 (value, offset,
noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 1, 0x7f, -0x80)\n if
(!Buffer.TYPED_ARRAY_SUPPORT) value = Math.floor(value)\n if (value < 0) value = 0xff + value + 1\n
this[offset] = (value & 0xff)\n return offset + 1\n}\n\nBuffer.prototype.writeInt16LE = function writeInt16LE
(value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2,
0x7fff, -0x8000)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value & 0xff)\n this[offset + 1] =
(value >>> 8)\n } else {\n objectWriteUInt16(this, value, offset, true)\n }\n return offset +
2\n}\n\nBuffer.prototype.writeInt16BE = function writeInt16BE (value, offset, noAssert) {\n value = +value\n
offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0x7fff, -0x8000)\n if
(Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>> 8)\n this[offset + 1] = (value & 0xff)\n }
else {\n objectWriteUInt16(this, value, offset, false)\n }\n return offset + 2\n}\n\nBuffer.prototype.writeInt32LE
= function writeInt32LE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert)
checkInt(this, value, offset, 4, 0x7fffffff, -0x80000000)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n
this[offset] = (value & 0xff)\n this[offset + 1] = (value >>> 8)\n this[offset + 2] = (value >>> 16)\n this[offset
+ 3] = (value >>> 24)\n } else {\n objectWriteUInt32(this, value, offset, true)\n }\n return offset +
4\n}\n\nBuffer.prototype.writeInt32BE = function writeInt32BE (value, offset, noAssert) {\n value = +value\n
offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0x7fffffff, -0x80000000)\n if (value < 0) value =

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0xffffffff + value + 1\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n   this[offset] = (value >>> 24)\n   this[offset + 1] = (value >>> 16)\n   this[offset + 2] = (value >>> 8)\n   this[offset + 3] = (value & 0xff)\n } else {\n   objectWriteUInt32(this, value, offset, false)\n }\n return offset + 4\n}\n\nfunction checkIEEE754 (buf, value, offset, ext, max, min) {\n  if (offset + ext > buf.length) throw new RangeError('Index out of range')\n  if (offset < 0) throw new RangeError('Index out of range')\n}\n\nfunction writeFloat (buf, value, offset, littleEndian, noAssert) {\n  if (!noAssert) {\n    checkIEEE754(buf, value, offset, 4, 3.4028234663852886e+38, -3.4028234663852886e+38)\n  }\n  ieee754.write(buf, value, offset, littleEndian, 23, 4)\n  return offset + 4\n}\n\nBuffer.prototype.writeFloatLE = function writeFloatLE (value, offset, noAssert) {\n  return writeFloat(this, value, offset, true, noAssert)\n}\n\nBuffer.prototype.writeFloatBE = function writeFloatBE (value, offset, noAssert) {\n  return writeFloat(this, value, offset, false, noAssert)\n}\n\nfunction writeDouble (buf, value, offset, littleEndian, noAssert) {\n  if (!noAssert) {\n    checkIEEE754(buf, value, offset, 8, 1.7976931348623157E+308, -1.7976931348623157E+308)\n  }\n  ieee754.write(buf, value, offset, littleEndian, 52, 8)\n  return offset + 8\n}\n\nBuffer.prototype.writeDoubleLE = function writeDoubleLE (value, offset, noAssert) {\n  return writeDouble(this, value, offset, true, noAssert)\n}\n\nBuffer.prototype.writeDoubleBE = function writeDoubleBE (value, offset, noAssert) {\n  return writeDouble(this, value, offset, false, noAssert)\n}\n\n// copy(targetBuffer, targetStart=0, sourceStart=0, sourceEnd=buffer.length)\nBuffer.prototype.copy = function copy (target, targetStart, start, end) {\n  if (!start) start = 0\n  if (!end && end !== 0) end = this.length\n  if (targetStart >= target.length) targetStart = target.length\n  if (!targetStart) targetStart = 0\n  if (end > 0 && end < start) end = start\n\n  // Copy 0 bytes; we're done\n  if (end === start) return 0\n  if (target.length === 0 || this.length === 0) return 0\n\n  // Fatal error conditions\n  if (targetStart < 0) {\n    throw new RangeError('targetStart out of bounds')\n  }\n  if (start < 0 || start >= this.length) throw new RangeError('sourceStart out of bounds')\n  if (end < 0) throw new RangeError('sourceEnd out of bounds')\n\n  // Are we oob?\n  if (end > this.length) end = this.length\n  if (target.length - targetStart < end - start) {\n    end = target.length - targetStart + start\n  }\n\n  var len = end - start\n  var i\n\n  if (this === target && start < targetStart && targetStart < end) {\n    // descending copy from end\n    for (i = len - 1; i >= 0; --i) {\n      target[i + targetStart] = this[i + start]\n    }\n  } else if (len < 1000 || !Buffer.TYPED_ARRAY_SUPPORT) {\n    // ascending copy from start\n    for (i = 0; i < len; ++i) {\n      target[i + targetStart] = this[i + start]\n    }\n  } else {\n    Uint8Array.prototype.set.call(\n      target,\n      this.subarray(start, start + len),\n      targetStart\n    )\n  }\n\n  return len\n}\n\n// Usage:\n// buffer.fill(number[, offset[, end]])\n// buffer.fill(buffer[, offset[, end]])\n// buffer.fill(string[, offset[, end]][, encoding])\nBuffer.prototype.fill = function fill (val, start, end, encoding) {\n  // Handle string cases:\n  if (typeof val === 'string') {\n    if (typeof start === 'string') {\n      encoding = start\n      start = 0\n      end = this.length\n    } else if (typeof end === 'string') {\n      encoding = end\n      end = this.length\n    }\n    if (val.length === 1) {\n      var code = val.charCodeAt(0)\n      if (code < 256) {\n        val = code\n      }\n    }\n    if (encoding !== undefined && typeof encoding !== 'string') {\n      throw new TypeError('encoding must be a string')\n    }\n    if (typeof encoding === 'string' && !Buffer.isEncoding(encoding)) {\n      throw new TypeError('Unknown encoding: ' + encoding)\n    }\n  } else if (typeof val === 'number') {\n    val = val & 255\n  }\n\n  // Invalid ranges are not set to a default, so can range check early.\n  if (start < 0 || this.length < start || this.length < end) {\n    throw new RangeError('Out of range index')\n  }\n\n  if (end <= start) {\n    return this\n  }\n\n  start = start >>> 0\n  end = end === undefined ? this.length : end >>> 0\n  if (!val) val = 0\n  var i\n  if (typeof val === 'number') {\n    for (i = start; i < end; ++i) {\n      this[i] = val\n    }\n  } else {\n    var bytes = Buffer.isBuffer(val) ? val : utf8ToBytes(new Buffer(val, encoding).toString())\n    var len = bytes.length\n    for (i = 0; i < end - start; ++i) {\n      this[i + start] = bytes[i % len]\n    }\n  }\n\n  return this\n}\n\n// HELPER FUNCTIONS\n// =====\n\nINVALID_BASE64_RE = /^[^+\\0-9A-Za-z-_/g\nfunction base64clean (str) {\n  // Node strips out invalid characters like \\n and \\t from the string, base64-js does not\n  str = stringtrim(str).replace(INVALID_BASE64_RE, '')\n  // Node converts strings with length < 2 to \"\n  if (str.length < 2) return \"\n  // Node allows for non-padded base64 strings (missing trailing ===), base64-js does not\n  while (str.length % 4 !== 0) {\n    str = str + '='\n  }\n  return str\n}\n\nfunction stringtrim (str) {\n  if (str.trim) return str.trim()\n  return str.replace(/^\\s+|\\s+$/g, '')\n}\n\nfunction toHex (n) {\n  if (n < 16) return '0' + n.toString(16)\n  return n.toString(16)\n}\n\nfunction

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utf8ToBytes (string, units) {\n units = units || Infinity\n var codePoint\n var length = string.length\n var
leadSurrogate = null\n var bytes = []\n\n for (var i = 0; i < length; ++i) {\n codePoint = string.charCodeAt(i)\n\n
// is surrogate component\n if (codePoint > 0xD7FF && codePoint < 0xE000) {\n // last char was a lead\n if
(!leadSurrogate) {\n // no lead yet\n if (codePoint > 0xDBFF) {\n // unexpected trail\n if ((units -
= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n continue\n } else if (i + 1 === length) {\n // unpaired
lead\n if ((units -= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n continue\n }\n\n // valid lead\n
leadSurrogate = codePoint\n\n continue\n }\n\n // 2 leads in a row\n if (codePoint < 0xDC00) {\n
if ((units -= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n leadSurrogate = codePoint\n continue\n }\n\n
// valid surrogate pair\n codePoint = (leadSurrogate - 0xD800 << 10 | codePoint - 0xDC00) + 0x10000\n } else
if (leadSurrogate) {\n // valid bmp char, but last char was a lead\n if ((units -= 3) > -1) bytes.push(0xEF,
0xBF, 0xBD)\n }\n\n leadSurrogate = null\n\n // encode utf8\n if (codePoint < 0x80) {\n if ((units -= 1) <
0) break\n bytes.push(codePoint)\n } else if (codePoint < 0x800) {\n if ((units -= 2) < 0) break\n
bytes.push(\n codePoint >> 0x6 | 0xC0,\n codePoint & 0x3F | 0x80\n )\n } else if (codePoint <
0x10000) {\n if ((units -= 3) < 0) break\n bytes.push(\n codePoint >> 0xC | 0xE0,\n codePoint >>
0x6 & 0x3F | 0x80,\n codePoint & 0x3F | 0x80\n )\n } else if (codePoint < 0x110000) {\n if ((units -=
4) < 0) break\n bytes.push(\n codePoint >> 0x12 | 0xF0,\n codePoint >> 0xC & 0x3F | 0x80,\n
codePoint >> 0x6 & 0x3F | 0x80,\n codePoint & 0x3F | 0x80\n )\n } else {\n throw new Error('Invalid
code point')\n }\n }\n\n return bytes\n}\n\nfunction asciiToBytes (str) {\n var byteArray = []\n for (var i = 0; i <
str.length; ++i) {\n // Node's code seems to be doing this and not & 0x7F..\n byteArray.push(str.charCodeAt(i) &
0xFF)\n }\n return byteArray\n}\n\nfunction utf16leToBytes (str, units) {\n var c, hi, lo\n var byteArray = []\n for
(var i = 0; i < str.length; ++i) {\n if ((units -= 2) < 0) break\n c = str.charCodeAt(i)\n hi = c >> 8\n lo = c %
256\n byteArray.push(lo)\n byteArray.push(hi)\n }\n\n return byteArray\n}\n\nfunction base64ToBytes (str)
{\n return base64.toByteArray(base64clean(str))\n}\n\nfunction blitBuffer (src, dst, offset, length) {\n for (var i =
0; i < length; ++i) {\n if ((i + offset >= dst.length) || (i >= src.length)) break\n dst[i + offset] = src[i]\n }\n return
i}\n\nfunction isnan (val) {\n return val !== val // eslint-disable-line no-self-compare\n}\n\n"/**\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {complex} from './ops/complex';\nimport {tensor} from './ops/tensor';\nimport {NamedTensor,
NamedTensorMap} from './tensor_types';\nimport {TypedArray} from './types';\nimport {sizeFromShape} from
'./util';\nimport {DTYPE_VALUE_SIZE_MAP, ModelArtifacts, ModelArtifactsInfo, WeightGroup,
WeightsManifestEntry} from './types';\n\n/** Number of bytes reserved for the length of the string. (32bit integer).
*\n\nconst NUM_BYTES_STRING_LENGTH = 4;\n\n/**\n * Encode a map from names to weight values as an
ArrayBuffer, along with an\n * `Array` of `WeightsManifestEntry` as specification of the encoded weights.\n *
This function does not perform sharding.\n * This function is the reverse of `decodeWeights`.\n * @param
tensors A map ("dict") from names to tensors.\n * @param group Group to which the weights belong (optional).\n
* @returns A `Promise` of\n * - A flat `ArrayBuffer` with all the binary values of the `Tensor`s\n *
concatenated.\n * - An `Array` of `WeightManifestEntry`s, carrying information including\n * tensor names,
`dtype`s and shapes.\n * @throws Error: on unsupported tensor `dtype`.\n\nexport async function
encodeWeights(\n tensors: NamedTensorMap|NamedTensor[], group?: WeightGroup):\n Promise<{data:
ArrayBuffer, specs: WeightsManifestEntry[]}> {\n // TODO(adarob, cais): Support quantization.\n const specs:
WeightsManifestEntry[] = [];\n const dataPromises: Array<Promise<TypedArray>> = [];\n\n const names: string[]
= Array.isArray(tensors) ?\n tensors.map(tensor => tensor.name) :\n Object.keys(tensors);\n\n for (let i = 0; i
< names.length; ++i) {\n const name = names[i];\n const t = Array.isArray(tensors) ? tensors[i].tensor :

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tensors[name];\n  if (t.dtype !== 'float32' && t.dtype !== 'int32' && t.dtype !== 'bool' &&\n    t.dtype !== 'string' && t.dtype !== 'complex64') {\n    throw new Error(`Unsupported dtype in weight '${name}':\n    ${t.dtype}`);\n  }\n  const spec: WeightsManifestEntry = {name, shape: t.shape, dtype: t.dtype};\n  if (t.dtype\n  === 'string') {\n    const utf8bytes = new Promise<TypedArray>(async resolve => {\n      const vals = await\n      t.bytes() as Uint8Array[];\n      const totalNumBytes = vals.reduce((p, c) => p + c.length, 0) +\n      NUM_BYTES_STRING_LENGTH;\n      const bytes = new Uint8Array(totalNumBytes);\n      let\n      offset = 0;\n      for (let i = 0; i < vals.length; i++) {\n        const val = vals[i];\n        const bytesOfLength =\n        new Uint8Array(new Uint32Array([val.length]).buffer);\n        bytes.set(bytesOfLength, offset);\n        offset\n        += NUM_BYTES_STRING_LENGTH;\n        bytes.set(val, offset);\n        offset += val.length;\n      }\n      resolve(bytes);\n    });\n    dataPromises.push(utf8bytes);\n  } else {\n    dataPromises.push(t.data());\n  }\n  if\n  (group != null) {\n    spec.group = group;\n  }\n  specs.push(spec);\n}\n\nconst tensorValues = await\nPromise.all(dataPromises);\nreturn {data: concatenateTypedArrays(tensorValues), specs};\n\n\n**\n * Decode\n flat ArrayBuffer as weights.\n * This function does not handle sharding.\n * This function is the reverse of\n `encodeWeights`.\n * @param buffer A flat ArrayBuffer carrying the binary values of the tensors\n * concatenated in the order specified in `specs`.\n * @param specs Specifications of the names, dtypes and shapes of\n the tensors\n * whose value are encoded by `buffer`.\n * @return A map from tensor name to tensor value, with the\n names corresponding\n * to names in `specs`.\n * @throws Error, if any of the tensors has unsupported dtype.\n\n\nexport function decodeWeights(\n  buffer: ArrayBuffer, specs: WeightsManifestEntry[]): NamedTensorMap\n{\n  // TODO(adarob, cais): Support quantization.\n  const out: NamedTensorMap = {};\n  let float16Decode:\n  (buffer: Uint16Array) => Float32Array | undefined;\n  let offset = 0;\n  for (const spec of specs) {\n    const name =\n    spec.name;\n    const dtype = spec.dtype;\n    const shape = spec.shape;\n    const size = sizeFromShape(shape);\n    let values: TypedArray|string[]|Uint8Array[];\n    if ('quantization' in spec) {\n      const quantization =\n      spec.quantization;\n      if (quantization.dtype === 'uint8' || quantization.dtype === 'uint16') {\n        if (!('min' in\n        quantization && 'scale' in quantization)) {\n          throw new Error(\n            `Weight ${spec.name} with\n            quantization ${quantization.dtype} ` +\n            `doesn't have corresponding metadata min and scale.`);\n        }\n      } else if (quantization.dtype === 'float16') {\n        if (dtype !== 'float32') {\n          throw new Error(\n            `Weight ${spec.name} is quantized with ${quantization.dtype} ` +\n            `which only supports weights of type\n            float32 not ${dtype}.`);\n        }\n      } else {\n        throw new Error(\n          `Weight ${spec.name} has unknown\n          ` +\n          `quantization dtype ${quantization.dtype}. ` +\n          `Supported quantization dtypes are: ` +\n          `'uint8', 'uint16', and 'float16'.`);\n      }\n      const quantizationSizeFactor =\n      DTYPE_VALUE_SIZE_MAP[quantization.dtype];\n      const byteBuffer =\n      buffer.slice(offset, offset + size\n      * quantizationSizeFactor);\n      const quantizedArray = (quantization.dtype === 'uint8') ?\n      new\n      Uint8Array(byteBuffer) :\n      new Uint16Array(byteBuffer);\n      if (dtype === 'float32') {\n        if\n        (quantization.dtype === 'uint8' || quantization.dtype === 'uint16') {\n          values = new\n          Float32Array(quantizedArray.length);\n          for (let i = 0; i < quantizedArray.length; i++) {\n            const v =\n            quantizedArray[i];\n            values[i] = v * quantization.scale + quantization.min;\n          }\n        } else if\n        (quantization.dtype === 'float16') {\n          if (float16Decode === undefined) {\n            float16Decode =\n            getFloat16Decoder();\n          }\n          values = float16Decode(quantizedArray as Uint16Array);\n        } else {\n          throw new Error(\n            `Unsupported quantization type ${quantization.dtype} ` +\n            `for weight type\n            float32.`);\n        }\n      } else if (dtype === 'int32') {\n        if (quantization.dtype !== 'uint8' && quantization.dtype\n        !== 'uint16') {\n          throw new Error(\n            `Unsupported quantization type ${quantization.dtype} ` +\n            `for weight type\n            int32.`);\n        }\n        values = new Int32Array(quantizedArray.length);\n        for (let i = 0; i <\n        quantizedArray.length; i++) {\n          const v = quantizedArray[i];\n          values[i] = Math.round(v *\n          quantization.scale + quantization.min);\n        }\n      } else {\n        throw new Error(`Unsupported dtype in weight\n        '${name}': ${dtype}`);\n      }\n      offset += size * quantizationSizeFactor;\n    } else if (dtype === 'string') {\n      const size = sizeFromShape(spec.shape);\n      values = [];\n      for (let i = 0; i < size; i++) {\n        const byteLength\n        = new Uint32Array(\n          buffer.slice(offset, offset + NUM_BYTES_STRING_LENGTH))[0];\n        offset +=\n        NUM_BYTES_STRING_LENGTH;\n        const bytes = new Uint8Array(buffer.slice(offset, offset +

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byteLength));\n    (values as Uint8Array[]).push(bytes);\n    offset += byteLength;\n  }\n } else {\n  const
dtypeFactor = DTYPE_VALUE_SIZE_MAP[dtype];\n  const byteBuffer = buffer.slice(offset, offset + size *
dtypeFactor);\n\n  if (dtype === 'float32') {\n    values = new Float32Array(byteBuffer);\n  } else if (dtype
=== 'int32') {\n    values = new Int32Array(byteBuffer);\n  } else if (dtype === 'bool') {\n    values = new
Uint8Array(byteBuffer);\n  } else if (dtype === 'complex64') {\n    values = new Float32Array(byteBuffer);\n
    const real = new Float32Array(values.length / 2);\n    const image = new Float32Array(values.length / 2);\n
for (let i = 0; i < real.length; i++) {\n    real[i] = values[i * 2];\n    image[i] = values[i * 2 + 1];\n  }\n
const realTensor = tensor(real, shape, 'float32');\n  const imageTensor = tensor(image, shape, 'float32');\n
out[name] = complex(realTensor, imageTensor);\n  realTensor.dispose();\n  imageTensor.dispose();\n }
else {\n  throw new Error('Unsupported dtype in weight `${name}`: `${dtype}`');\n }\n offset += size *
dtypeFactor;\n }\n if (dtype !== 'complex64') {\n  out[name] = tensor(values, shape, dtype);\n }\n }\n
return out;\n}\n\n/**\n * Concatenate TypedArrays into an ArrayBuffer.\n */\nexport function
concatenateTypedArrays(xs: TypedArray[]): ArrayBuffer {\n // TODO(adarob, cais): Support quantization.\n if (xs
=== null) {\n  throw new Error('Invalid input value: ${JSON.stringify(xs)}');\n }\n\n let totalByteLength = 0;\n\n
// `normalizedXs` is here for this reason: a `TypedArray`s `buffer`\n // can have a different byte length from that of
the `TypedArray` itself,\n // for example, when the `TypedArray` is created from an offset in an\n // `ArrayBuffer`.
`normlizedXs` holds `TypedArray`s whose `buffer`s match\n // the `TypedArray` in byte length. If an element of
`xs` does not show\n // this property, a new `TypedArray` that satisfy this property will be\n // constructed and
pushed into `normalizedXs`. \n const normalizedXs: TypedArray[] = [];\n xs.forEach((x: TypedArray) => {\n
totalByteLength += x.byteLength;\n // tslint:disable:no-any\n normalizedXs.push(\n x.byteLength ===
x.buffer.byteLength ? x :\n new (x.constructor as any)(x);\n if (!(x as any instanceof
Float32Array || x as any instanceof Int32Array ||\n x as any instanceof Uint8Array)) {\n  throw new
Error('Unsupported TypedArray subtype: ${x.constructor.name}');\n }\n // tslint:enable:no-any\n });\n\n const
y = new Uint8Array(totalByteLength);\n let offset = 0;\n normalizedXs.forEach((x: TypedArray) => {\n
y.set(new Uint8Array(x.buffer), offset);\n offset += x.byteLength;\n });\n\n return y.buffer;\n}\n\n// Use Buffer
on Node.js instead of Blob/atob/btoa\nconst useNodeBuffer = typeof Buffer !== 'undefined' &&\n (typeof Blob
=== 'undefined' || typeof atob === 'undefined' ||\n typeof btoa === 'undefined');\n\n/**\n * Calculate the byte
length of a JavaScript string.\n *\n * Note that a JavaScript string can contain wide characters, therefore the\n *
length of the string is not necessarily equal to the byte length.\n *\n * @param str Input string.\n * @returns Byte
length.\n */\nexport function stringByteLength(str: string): number {\n if (useNodeBuffer) {\n  return
Buffer.byteLength(str);\n }\n return new Blob([str]).size;\n}\n\n/**\n * Encode an ArrayBuffer as a base64
encoded string.\n *\n * @param buffer `ArrayBuffer` to be converted.\n * @returns A string that base64-encodes
`buffer`. \n */\nexport function arrayBufferToBase64String(buffer: ArrayBuffer): string {\n if (useNodeBuffer) {\n
return Buffer.from(buffer).toString('base64');\n }\n const buf = new Uint8Array(buffer);\n let s = '';\n for (let i = 0,
l = buf.length; i < l; i++) {\n  s += String.fromCharCode(buf[i]);\n }\n return btoa(s);\n}\n\n/**\n * Decode a
base64 string as an ArrayBuffer.\n *\n * @param str Base64 string.\n * @returns Decoded `ArrayBuffer`. \n
*/\nexport function base64StringToArrayBuffer(str: string): ArrayBuffer {\n if (useNodeBuffer) {\n  const buf =
Buffer.from(str, 'base64');\n  return buf.buffer.slice(buf.byteOffset, buf.byteOffset + buf.byteLength);\n }\n const
s = atob(str);\n const buffer = new Uint8Array(s.length);\n for (let i = 0; i < s.length; ++i) {\n
buffer.set([s.charCodeAt(i)], i);\n }\n return buffer.buffer;\n}\n\n/**\n * Concatenate a number of ArrayBuffers
into one.\n *\n * @param buffers A number of array buffers to concatenate.\n * @returns Result of concatenating
`buffers` in order.\n */\nexport function concatenateArrayBuffers(buffers: ArrayBuffer[]): ArrayBuffer {\n if
(buffers.length === 1) {\n  return buffers[0];\n }\n\n let totalByteLength = 0;\n buffers.forEach((buffer:
ArrayBuffer) => {\n  totalByteLength += buffer.byteLength;\n });\n\n const temp = new
Uint8Array(totalByteLength);\n let offset = 0;\n buffers.forEach((buffer: ArrayBuffer) => {\n  temp.set(new
Uint8Array(buffer), offset);\n  offset += buffer.byteLength;\n });\n return temp.buffer;\n}\n\n/**\n * Get the
basename of a path.\n *\n * Behaves in a way analogous to Linux's basename command.\n *\n * @param path\n
*/\nexport function basename(path: string): string {\n const SEPARATOR = '/';\n path = path.trim();\n while

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(path.endsWith(SEPARATOR)) {\n path = path.slice(0, path.length - 1);\n }\n const items =
path.split(SEPARATOR);\n return items[items.length - 1];\n}\n\n/**\n * Populate ModelArtifactsInfo fields for a
model with JSON topology.\n * @param modelArtifacts\n * @returns A ModelArtifactsInfo object.\n */\nexport
function getModelArtifactsInfoForJSON(modelArtifacts: ModelArtifacts): ModelArtifactsInfo {\n if
(modelArtifacts.modelTopology instanceof ArrayBuffer) {\n throw new Error('Expected JSON model topology,
received ArrayBuffer.'); }\n\n return {\n dateSaved: new Date(),\n modelTopologyType: 'JSON',\n
modelTopologyBytes: modelArtifacts.modelTopology == null ?\n 0 :\n
stringByteLength(JSON.stringify(modelArtifacts.modelTopology)),\n weightSpecsBytes:
modelArtifacts.weightSpecs == null ?\n 0 :\n
stringByteLength(JSON.stringify(modelArtifacts.weightSpecs)),\n weightDataBytes: modelArtifacts.weightData
== null ?\n 0 :\n modelArtifacts.weightData.byteLength,\n });\n}\n\n/**\n * Computes mantisa table for
casting Float16 to Float32\n * See http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n * @returns
Uint32Array, 2048 mantissa lookup values.\n */\nfunction computeFloat16MantisaTable(): Uint32Array {\n const
convertMantissa = (i: number): number => {\n let m = i << 13;\n let e = 0;\n\n while ((m & 0x00800000) ===
0) {\n e -= 0x00800000;\n m <<= 1;\n }\n m &= ~0x00800000;\n e += 0x38800000;\n\n return m | e;\n
};\n\n const mantisaTable = new Uint32Array(2048);\n\n mantisaTable[0] = 0;\n for (let i = 1; i < 1024; i++) {\n
mantisaTable[i] = convertMantissa(i);\n }\n for (let i = 1024; i < 2048; i++) {\n mantisaTable[i] = 0x38000000 +
((i - 1024) << 13);\n }\n\n return mantisaTable;\n}\n\n/**\n * Computes exponent table for casting Float16 to
Float32\n * See http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n * @returns Uint32Array, 64
exponent lookup values.\n */\nfunction computeFloat16ExponentTable(): Uint32Array {\n const exponentTable =
new Uint32Array(64);\n\n exponentTable[0] = 0;\n exponentTable[31] = 0x47800000;\n exponentTable[32] =
0x80000000;\n exponentTable[63] = 0xc7800000;\n for (let i = 1; i < 31; i++) {\n exponentTable[i] = i << 23;\n
}\n for (let i = 33; i < 63; i++) {\n exponentTable[i] = 0x80000000 + ((i - 32) << 23);\n }\n\n return
exponentTable;\n}\n\n/**\n * Computes offset table for casting Float16 to Float32\n * See http://www.fox-
toolkit.org/ftp/fasthalffloatconversion.pdf\n * @returns Uint32Array, 6d offset values.\n */\nfunction
computeFloat16OffsetTable(): Uint32Array {\n const offsetTable = new Uint32Array(64);\n\n for (let i = 0; i < 64;
i++) {\n offsetTable[i] = 1024;\n }\n\n offsetTable[0] = offsetTable[32] = 0;\n\n return offsetTable;\n}\n\n/**\n *
Retrieve a Float16 decoder which will decode a ByteArray of Float16 values\n * to a Float32Array.\n * @returns
Function (buffer: Uint16Array) => Float32Array which decodes\n * the Uint16Array of Float16
bytes to a Float32Array.\n */\nexport function getFloat16Decoder(): (buffer: Uint16Array) => Float32Array {\n //
Algorithm is based off of\n // http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n // Cache lookup
tables\n const mantisaTable = computeFloat16MantisaTable();\n const exponentTable =
computeFloat16ExponentTable();\n const offsetTable = computeFloat16OffsetTable();\n\n return (quantizedArray:
Uint16Array) => {\n const buffer = new ArrayBuffer(4 * quantizedArray.length);\n const bufferUint32View =
new Uint32Array(buffer);\n for (let index = 0; index < quantizedArray.length; index++) {\n const float16Bits =
quantizedArray[index];\n const float32Bits =\n mantisaTable[offsetTable[float16Bits >> 10] + (float16Bits
& 0x3ff)] +\n exponentTable[float16Bits >> 10];\n bufferUint32View[index] = float32Bits;\n }\n\n return
new Float32Array(buffer);\n };\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */\n\n
=====}\n\n\nimport {IOHandler, LoadOptions} from './types';\n\nexport type IORouter = (url: string|string[], loadOptions?:
LoadOptions) => IOHandler;\n\nexport class IORouterRegistry {\n // Singleton instance.\n private static
instance: IORouterRegistry;\n\n private saveRouters: IORouter[];\n private loadRouters: IORouter[];\n\n private
```



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IOHandlers and print them in the error message.\n  throw new Error(\n    'Failed to obtain IndexedDB factory
because the current environment' +\n    ' is not a web browser.');
```

```

\n } \n // tslint:disable-next-line:no-any\n const
theWindow: any = typeof window === 'undefined' ? self : window;\n const factory = theWindow.indexedDB ||
theWindow.mozIndexedDB ||\n  theWindow.webkitIndexedDB || theWindow.msIndexedDB ||\n
theWindow.shimIndexedDB;\n if (factory == null) {\n  throw new Error(\n    'The current browser does not
appear to support IndexedDB.');
```

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\n } \n return factory;\n}\n\nfunction setUpDatabase(openRequest: IDBRequest)
{\n  const db = openRequest.result as IDBDatabase;\n  db.createObjectStore(MODEL_STORE_NAME, {keyPath:
'modelPath'});\n  db.createObjectStore(INFO_STORE_NAME, {keyPath: 'modelPath'});\n}\n\n/**\n * IOHandler
subclass: Browser IndexedDB.\n * \n * See the doc string of `browserIndexedDB` for more details.\n */\nexport class
BrowserIndexedDB implements IOHandler {\n  protected readonly indexedDB: IDBFactory;\n  protected readonly
modelPath: string;\n\n  static readonly URL_SCHEME = 'indexeddb://';\n\n  constructor(modelPath: string) {\n
this.indexedDB = getIndexedDBFactory();\n\n  if (modelPath == null || !modelPath) {\n    throw new Error(\n
'For IndexedDB, modelPath must not be null, undefined or empty.');
```

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\n  }\n  this.modelPath = modelPath;\n}\n\nasync save(modelArtifacts: ModelArtifacts): Promise<SaveResult> {\n
// TODO(cais): Support saving GraphDef
models.\n  if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n    throw new Error(\n
'BrowserLocalStorage.save() does not support saving model topology ' +\n    ' in binary formats yet.');
```

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\n  }\n  return this.databaseAction(this.modelPath, modelArtifacts) as\n    Promise<SaveResult>;\n}\n\nasync load():
Promise<ModelArtifacts> {\n  return this.databaseAction(this.modelPath) as Promise<ModelArtifacts>;\n}\n\n
/**\n * Perform database action to put model artifacts into or read model artifacts\n * from IndexedDB object
store.\n * \n * Whether the action is put or get depends on whether `modelArtifacts` is\n * specified. If it is
specified, the action will be put; otherwise the action\n * will be get.\n * \n * @param modelPath A unique string
path for the model.\n * @param modelArtifacts If specified, it will be the model artifacts to be\n * stored in
IndexedDB.\n * @returns A `Promise` of `SaveResult`, if the action is put, or a `Promise` \n * of
`ModelArtifacts`, if the action is get.\n */\n private databaseAction(modelPath: string, modelArtifacts?:
ModelArtifacts):\n  Promise<ModelArtifacts|SaveResult> {\n  return new
Promise<ModelArtifacts|SaveResult>((resolve, reject) => {\n    const openRequest =
this.indexedDB.open(DATABASE_NAME, DATABASE_VERSION);\n    openRequest.onupgradeneeded = () =>
setUpDatabase(openRequest);\n\n    openRequest.onsuccess = () => {\n    const db = openRequest.result;\n\n
if (modelArtifacts == null) {\n      // Read model out from object store.\n      const modelTx =
db.transaction(MODEL_STORE_NAME, 'readonly');\n      const modelStore =
modelTx.objectStore(MODEL_STORE_NAME);\n      const getRequest = modelStore.get(this.modelPath);\n
getRequest.onsuccess = () => {\n        if (getRequest.result == null) {\n          db.close();\n          return
reject(new Error(\n            `Cannot find model with path '${this.modelPath}'` +\n            '\n
IndexedDB. `));\n        } else {\n          resolve(getRequest.result.modelArtifacts);\n        }\n      };\n
getRequest.onerror = error => {\n        db.close();\n        return reject(getRequest.error);\n      };\n
modelTx.oncomplete = () => db.close();\n    } else {\n      // Put model into object store.\n      const
modelArtifactsInfo: ModelArtifactsInfo =\n        getModelArtifactsInfoForJSON(modelArtifacts);\n      //
First, put ModelArtifactsInfo into info store.\n      const infoTx = db.transaction(INFO_STORE_NAME,
'readwrite');\n      let infoStore = infoTx.objectStore(INFO_STORE_NAME);\n      const putInfoRequest =\n
infoStore.put({ modelPath: this.modelPath, modelArtifactsInfo});\n      let modelTx: IDBTransaction;\n
putInfoRequest.onsuccess = () => {\n        // Second, put model data into model store.\n        modelTx =
db.transaction(MODEL_STORE_NAME, 'readwrite');\n        const modelStore =
modelTx.objectStore(MODEL_STORE_NAME);\n        const putModelRequest = modelStore.put({\n
modelPath: this.modelPath,\n          modelArtifacts,\n          modelArtifactsInfo\n        });\n
putModelRequest.onsuccess = () => resolve({modelArtifactsInfo});\n        putModelRequest.onerror = error =>
{\n          // If the put-model request fails, roll back the info entry as\n          // well.\n          infoStore =
infoTx.objectStore(INFO_STORE_NAME);\n          const deleteInfoRequest =
infoStore.delete(this.modelPath);\n          deleteInfoRequest.onsuccess = () => {\n            db.close();\n

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return reject(putModelRequest.error);\n        });\n        deleteInfoRequest.onerror = error => {\n
db.close();\n        return reject(putModelRequest.error);\n        });\n        });\n        });\n
putInfoRequest.onerror = error => {\n        db.close();\n        return reject(putInfoRequest.error);\n        });\n
infoTx.oncomplete = () => {\n        if (modelTx == null) {\n        db.close();\n        } else {\n
modelTx.oncomplete = () => db.close();\n        }\n        });\n        });\n        });\n        openRequest.onerror = error =>
reject(openRequest.error);\n        });\n        });\n        });\n        });\n        });\n        });\n
export const indexedDBRouter: IORouter = (url: string|string[]) => {\n
if (!env().getBool('IS_BROWSER')) {\n        return null;\n        } else {\n        if (!Array.isArray(url) &&
url.startsWith(BrowserIndexedDB.URL_SCHEME)) {\n        return
browserIndexedDB(url.slice(BrowserIndexedDB.URL_SCHEME.length));\n        } else {\n        return null;\n        }\n
});\n        IORouterRegistry.registerSaveRouter(indexedDBRouter);\n        IORouterRegistry.registerLoadRouter(indexedD
BRouter);\n        /**\n        * Creates a browser IndexedDB IOHandler for saving and loading models.\n        *```\n        * const
model = tf.sequential();\n        * model.add(\n        *   tf.layers.dense({ units: 1, inputShape: [100], activation: 'sigmoid'}));\n
*\n        * const saveResult = await model.save('indexeddb://MyModel');\n        * console.log(saveResult);\n        *```\n        *
@param modelPath A unique identifier for the model to be saved. Must be a\n        * non-empty string.\n        * @returns
An instance of `BrowserIndexedDB` (subclass of `IOHandler`),\n        * which can be used with, e.g.,
`tf.Model.save`.\n        */\n        export function browserIndexedDB(modelPath: string): IOHandler {\n        return new
BrowserIndexedDB(modelPath);\n        }\n        function maybeStripScheme(key: string) {\n        return
key.startsWith(BrowserIndexedDB.URL_SCHEME) ?\n        key.slice(BrowserIndexedDB.URL_SCHEME.length)
:\n        key;\n        }\n        export class BrowserIndexedDBManager implements ModelStoreManager {\n        private
indexedDB: IDBFactory;\n        constructor() {\n        this.indexedDB = getIndexedDBFactory();\n        }\n        async
listModels(): Promise<[[path: string]: ModelArtifactsInfo]> {\n        return new Promise<[[path: string]:
ModelArtifactsInfo]>(\n        (resolve, reject) => {\n        const openRequest =\n
this.indexedDB.open(DATABASE_NAME, DATABASE_VERSION);\n        openRequest.onupgradeneeded = ()
=> setUpDatabase(openRequest);\n        openRequest.onsuccess = () => {\n        const db =
openRequest.result;\n        const tx = db.transaction(INFO_STORE_NAME, 'readonly');\n        const store =
tx.objectStore(INFO_STORE_NAME);\n        // tslint:disable:max-line-length\n        // Need to cast `store` as
`any` here because TypeScript's DOM\n        // library does not have the `getAll()` method even though the\n
// method is supported in the latest version of most mainstream\n        // browsers;\n        //
https://developer.mozilla.org/en-US/docs/Web/API/IDBObjectStore/getAll\n        // tslint:enable:max-line-
length\n        // tslint:disable-next-line:no-any\n        const getAllInfoRequest = (store as any).getAll() as
IDBRequest;\n        getAllInfoRequest.onsuccess = () => {\n        const out: [[path: string]:
ModelArtifactsInfo] = {};\n        for (const item of getAllInfoRequest.result) {\n        out[item.modelPath]
= item.modelArtifactsInfo;\n        }\n        resolve(out);\n        });\n        getAllInfoRequest.onerror =
error => {\n        db.close();\n        return reject(getAllInfoRequest.error);\n        });\n        tx.oncomplete
= () => db.close();\n        });\n        openRequest.onerror = error => reject(openRequest.error);\n        });\n        });\n
async removeModel(path: string): Promise<ModelArtifactsInfo> {\n        path = maybeStripScheme(path);\n        return
new Promise<ModelArtifactsInfo>((resolve, reject) => {\n        const openRequest =
this.indexedDB.open(DATABASE_NAME, DATABASE_VERSION);\n        openRequest.onupgradeneeded = () =>
setUpDatabase(openRequest);\n        openRequest.onsuccess = () => {\n        const db = openRequest.result;\n
const infoTx = db.transaction(INFO_STORE_NAME, 'readwrite');\n        const infoStore =
infoTx.objectStore(INFO_STORE_NAME);\n        const getInfoRequest = infoStore.get(path);\n        let modelTx:
IDBTransaction;\n        getInfoRequest.onsuccess = () => {\n        if (getInfoRequest.result == null) {\n
db.close();\n        return reject(new Error(\n        `Cannot find model with path '${path}'` +\n        `in
IndexedDB.`));\n        } else {\n        // First, delete the entry in the info store.\n        const deleteInfoRequest =
infoStore.delete(path);\n        const deleteModelData = () => {\n        // Second, delete the entry in the model
store.\n        modelTx = db.transaction(MODEL_STORE_NAME, 'readwrite');\n        const modelStore =
modelTx.objectStore(MODEL_STORE_NAME);\n        const deleteModelRequest = modelStore.delete(path);\n
deleteModelRequest.onsuccess = () =>\n        resolve(getInfoRequest.result.modelArtifactsInfo);\n

```

```

    deleteModelRequest.onerror = error =>\n                reject(getInfoRequest.error);\n                });\n                // Proceed
with deleting model data regardless of whether deletion\n                // of info data succeeds or not.\n
deleteInfoRequest.onsuccess = deleteModelData;\n                deleteInfoRequest.onerror = error => {\n
deleteModelData();\n                db.close();\n                return reject(getInfoRequest.error);\n                };\n                }\n
};\n    getInfoRequest.onerror = error => {\n        db.close();\n        return reject(getInfoRequest.error);\n
};\n\n    infoTx.oncomplete = () => {\n        if (modelTx == null) {\n            db.close();\n        } else {\n
modelTx.oncomplete = () => db.close();\n        }\n    };\n    }; \n    openRequest.onerror = error =>
reject(openRequest.error);\n    });\n    }\n}\n", "**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport './flags';\nimport {env} from './environment';\n\nimport {assert} from './util';\nimport
{arrayBufferToBase64String, base64StringToArrayBuffer, getModelArtifactsInfoForJSON} from
 './io_utils';\nimport {IORouter, IORouterRegistry} from './router_registry';\nimport {IOHandler, ModelArtifacts,
ModelArtifactsInfo, ModelStoreManager, SaveResult} from './types';\n\nconst PATH_SEPARATOR = '/';\nconst
PATH_PREFIX = 'tensorflowjs_models';\nconst INFO_SUFFIX = 'info';\nconst MODEL_TOPOLOGY_SUFFIX =
'model_topology';\nconst WEIGHT_SPECS_SUFFIX = 'weight_specs';\nconst WEIGHT_DATA_SUFFIX =
'weight_data';\nconst MODEL_METADATA_SUFFIX = 'model_metadata';\n\n/**\n * Purge all tensorflow.js-
saved model artifacts from local storage.\n * \n * @returns Paths of the models purged.\n */\nexport function
purgeLocalStorageArtifacts(): string[] {\n    if (!env().getBool('IS_BROWSER') || typeof window === 'undefined' ||\n
typeof window.localStorage === 'undefined') {\n        throw new Error(\n            'purgeLocalStorageModels() cannot
proceed because local storage is '\n            'unavailable in the current environment.);\n    }\n    const LS =
window.localStorage;\n    const purgedModelPaths: string[] = [];\n    for (let i = 0; i < LS.length; ++i) {\n        const key =
LS.key(i);\n        const prefix = PATH_PREFIX + PATH_SEPARATOR;\n        if (key.startsWith(prefix) && key.length
> prefix.length) {\n            LS.removeItem(key);\n            const modelName = getModelPathFromKey(key);\n            if
(purgedModelPaths.indexOf(modelName) === -1) {\n                purgedModelPaths.push(modelName);\n            }\n        }\n
    }\n    return purgedModelPaths;\n}\n\nfunction getModelKeys(path: string): {\n    info: string,\n    topology: string,\n
weightSpecs: string,\n    weightData: string,\n    modelMetadata: string\n} {\n    return {\n        info: [PATH_PREFIX,
path, INFO_SUFFIX].join(PATH_SEPARATOR),\n        topology: [PATH_PREFIX, path,
MODEL_TOPOLOGY_SUFFIX].join(PATH_SEPARATOR),\n        weightSpecs: [PATH_PREFIX, path,
WEIGHT_SPECS_SUFFIX].join(PATH_SEPARATOR),\n        weightData: [PATH_PREFIX, path,
WEIGHT_DATA_SUFFIX].join(PATH_SEPARATOR),\n        modelMetadata: [PATH_PREFIX, path,
MODEL_METADATA_SUFFIX].join(PATH_SEPARATOR)\n    };\n}\n\n/**\n * Get model path from a local-
storage key.\n * \n * E.g., 'tensorflowjs_models/my/model/1/info' --> 'my/model/1'\n * \n * @param key\n */\nfunction
getModelPathFromKey(key: string) {\n    const items = key.split(PATH_SEPARATOR);\n    if
(items.length < 3) {\n        throw new Error(`Invalid key format: ${key}`);\n    }\n    return items.slice(1, items.length -
1).join(PATH_SEPARATOR);\n}\n\nfunction maybeStripScheme(key: string) {\n    return
key.startsWith(BrowserLocalStorage.URL_SCHEME) ?\n
key.slice(BrowserLocalStorage.URL_SCHEME.length) :\n    key;\n}\n\ndeclare type LocalStorageKeys = {\n
info: string,\n    topology: string,\n    weightSpecs: string,\n    weightData: string,\n    modelMetadata: string\n};\n\n/**\n
 * IOHandler subclass: Browser Local Storage.\n * \n * See the doc string to `browserLocalStorage` for more
details.\n */\nexport class BrowserLocalStorage implements IOHandler {\n    protected readonly LS: Storage;\n
protected readonly modelPath: string;\n    protected readonly keys: LocalStorageKeys;\n\n    static readonly
URL_SCHEME = 'localStorage://';\n\n    constructor(modelPath: string) {\n        if (!env().getBool('IS_BROWSER') ||

```

```

typeof window === 'undefined' ||\n      typeof window.localStorage === 'undefined') {\n      // TODO(cais): Add
more info about what IOHandler subtypes are\n      // available.\n      // Maybe point to a doc page on the web
and/or automatically determine\n      // the available IOHandlers and print them in the error message.\n      throw
new Error(\n      'The current environment does not support local storage.);\n    }\n    this.LS =
window.localStorage;\n\n    if (modelPath == null || !modelPath) {\n      throw new Error(\n      'For local storage,
modelPath must not be null, undefined or empty.);\n    }\n    this.modelPath = modelPath;\n    this.keys =
getModelKeys(this.modelPath);\n  }\n\n  /**\n   * Save model artifacts to browser local storage.\n   * See the
documentation to `browserLocalStorage` for details on the saved\n   * artifacts.\n   * @param modelArtifacts
The model artifacts to be stored.\n   * @returns An instance of SaveResult.\n   */\n  async save(modelArtifacts:
ModelArtifacts): Promise<SaveResult> {\n    if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n
throw new Error(\n      'BrowserLocalStorage.save() does not support saving model topology ' +\n      'in binary
formats yet.);\n    } else {\n      const topology = JSON.stringify(modelArtifacts.modelTopology);\n      const
weightSpecs = JSON.stringify(modelArtifacts.weightSpecs);\n\n      const modelArtifactsInfo: ModelArtifactsInfo
=\n      getModelArtifactsInfoForJSON(modelArtifacts);\n\n      try {\n        this.LS.setItem(this.keys.info,
JSON.stringify(modelArtifactsInfo));\n        this.LS.setItem(this.keys.topology, topology);\n
this.LS.setItem(this.keys.weightSpecs, weightSpecs);\n        this.LS.setItem(\n          this.keys.weightData,\n
arrayBufferToBase64String(modelArtifacts.weightData));\n        const result: ModelArtifacts = {\n          format:
modelArtifacts.format,\n          generatedBy: modelArtifacts.generatedBy,\n          convertedBy:
modelArtifacts.convertedBy\n        };\n        if (modelArtifacts.signature != null) {\n          result.signature =
modelArtifacts.signature;\n        }\n        if (modelArtifacts.userDefinedMetadata != null) {\n
result.userDefinedMetadata = modelArtifacts.userDefinedMetadata;\n        }\n        if
(modelArtifacts.modelInitializer != null) {\n          result.modelInitializer = modelArtifacts.modelInitializer;\n
}\n        this.LS.setItem(this.keys.modelMetadata, JSON.stringify(result));\n\n        return {modelArtifactsInfo};\n
      } catch (err) {\n        // If saving failed, clean up all items saved so far.\n        this.LS.removeItem(this.keys.info);\n
this.LS.removeItem(this.keys.topology);\n        this.LS.removeItem(this.keys.weightSpecs);\n
this.LS.removeItem(this.keys.weightData);\n        this.LS.removeItem(this.keys.modelMetadata);\n\n        throw new
Error(\n          `Failed to save model '${this.modelPath}' to local storage: ` +\n          `size quota being exceeded is
a possible cause of this failure: ` +\n          `modelTopologyBytes=${modelArtifactsInfo.modelTopologyBytes}, `
+\n          `weightSpecsBytes=${modelArtifactsInfo.weightSpecsBytes}, ` +\n
          `weightDataBytes=${modelArtifactsInfo.weightDataBytes}.`);\n      }\n    }\n  }\n\n  /**\n   * Load a model from
local storage.\n   * See the documentation to `browserLocalStorage` for details on the saved\n   * artifacts.\n   *
@returns The loaded model (if loading succeeds).\n   */\n  async load(): Promise<ModelArtifacts> {\n    const info =\n      JSON.parse(this.LS.getItem(this.keys.info)) as ModelArtifactsInfo;\n    if (info == null) {\n
throw new Error(\n      `In local storage, there is no model with name '${this.modelPath}'`);\n    }\n\n    if
(info.modelTopologyType !== 'JSON') {\n      throw new Error(\n      'BrowserLocalStorage does not support
loading non-JSON model ' +\n      'topology yet.);\n    }\n\n    const out: ModelArtifacts = {};\n\n    // Load
topology.\n    const topology = JSON.parse(this.LS.getItem(this.keys.topology));\n    if (topology == null) {\n
throw new Error(\n      `In local storage, the topology of model '${this.modelPath}' ` +\n      `is missing.);\n
}\n    out.modelTopology = topology;\n\n    // Load weight specs.\n    const weightSpecs =
JSON.parse(this.LS.getItem(this.keys.weightSpecs));\n    if (weightSpecs == null) {\n      throw new Error(\n
`In local storage, the weight specs of model '${this.modelPath}' ` +\n      `are missing.);\n    }\n
out.weightSpecs = weightSpecs;\n\n    // Load meta-data fields.\n    const metadataString =
this.LS.getItem(this.keys.modelMetadata);\n    if (metadataString != null) {\n      const metadata =
JSON.parse(metadataString) as ModelArtifacts;\n      out.format = metadata['format'];\n      out.generatedBy =
metadata['generatedBy'];\n      out.convertedBy = metadata['convertedBy'];\n      if (metadata['signature'] != null) {\n
out.signature = metadata['signature'];\n      }\n      if (metadata['userDefinedMetadata'] != null) {\n
out.userDefinedMetadata = metadata['userDefinedMetadata'];\n      }\n      if (metadata['modelInitializer'] != null) {\n
out.modelInitializer = metadata['modelInitializer'];\n      }\n    }\n\n    // Load weight data.\n    const

```

```

weightDataBase64 = this.LS.getItem(this.keys.weightData);
if (weightDataBase64 == null) {
  throw new Error(`In local storage, the binary weight values of model ` +
    `${this.modelPath}` are missing.`);
}
out.weightData = base64StringToArrayBuffer(weightDataBase64);
return out;
}
}
export const localStorageRouter: IORouter = (url: string|string[]) => {
  if (!env().getBool('IS_BROWSER')) {
    return null;
  } else {
    if (!Array.isArray(url) && url.startsWith(BrowserLocalStorage.URL_SCHEME)) {
      return browserLocalStorage(url.slice(BrowserLocalStorage.URL_SCHEME.length));
    } else {
      return null;
    }
  }
}
IORouterRegistry.registerSaveRouter(localStorageRouter);
IORouterRegistry.registerLoadRouter(localStorageRouter);
// Factory function for local storage IOHandler.
// This `IOHandler` supports both `save` and `load`.
// For each model's saved artifacts, four items are saved to local storage.
// -
// `${PATH_SEPARATOR}/${modelPath}/info`: Contains meta-info about the
// model, such as date saved, type of the topology, size in bytes, etc.
// -
// `${PATH_SEPARATOR}/${modelPath}/topology`: Model topology. For
// Keras-style models, this is a stringized JSON.
// -
// `${PATH_SEPARATOR}/${modelPath}/weight_specs`: Weight specs of the
// model, can be used to decode the saved binary weight values (see
// item below).
// -
// `${PATH_SEPARATOR}/${modelPath}/weight_data`: Concatenated binary
// weight values, stored as a base64-encoded string.
// Saving may throw an `Error` if the total size of the artifacts exceed the
// browser-specific quota.
// @param modelPath A unique identifier for the model to be saved. Must be a
// non-empty string.
// @returns An instance of `IOHandler`, which can be used with, e.g.,
// `tf.Model.save`.
export function browserLocalStorage(modelPath: string): IOHandler {
  return new BrowserLocalStorage(modelPath);
}
export class BrowserLocalStorageManager implements ModelStoreManager {
  private readonly LS: Storage;
  constructor() {
    assert(!env().getBool('IS_BROWSER'), () => 'Current environment is not a web browser');
    assert(!typeof window === 'undefined' || !typeof window.localStorage !== 'undefined', () => 'Current browser does not appear to support localStorage');
    this.LS = window.localStorage;
  }
  async listModels(): Promise<[[path: string]: ModelArtifactsInfo]> {
    const out: {[path: string]: ModelArtifactsInfo} = {};
    const prefix = PATH_PREFIX + PATH_SEPARATOR;
    const suffix = PATH_SEPARATOR + INFO_SUFFIX;
    for (let i = 0; i < this.LS.length; ++i) {
      const key = this.LS.key(i);
      if (key.startsWith(prefix) && key.endsWith(suffix)) {
        const modelPath = getModelPathFromKey(key);
        out[modelPath] = JSON.parse(this.LS.getItem(key)) as ModelArtifactsInfo;
      }
    }
    return out;
  }
  async removeModel(path: string): Promise<ModelArtifactsInfo> {
    path = maybeStripScheme(path);
    const keys = getModelKeys(path);
    if (this.LS.getItem(keys.info) == null) {
      throw new Error(`Cannot find model at path '${path}'`);
    }
    const info = JSON.parse(this.LS.getItem(keys.info)) as ModelArtifactsInfo;
    this.LS.removeItem(keys.info);
    this.LS.removeItem(keys.topology);
    this.LS.removeItem(keys.weightSpecs);
    this.LS.removeItem(keys.weightData);
    return info;
  }
}
// Classes and functions for model management across multiple storage mediums.
// Supported client actions:
// - Listing models on all registered storage mediums.
// - Remove model by URL from any registered storage mediums, by using URL
// string.
// - Moving or copying model from one path to another in the same medium or from
// one medium to another, by using URL strings.
import {assert} from './util';
import {IORouterRegistry} from './router_registry';
import {ModelArtifactsInfo, ModelStoreManager} from './types';
const URL_SCHEME_SUFFIX = '://';
export class ModelStoreManagerRegistry {
  //

```



```

Singleton instance.\n private static instance: ModelStoreManagerRegistry;\n\n private managers: {[scheme: string]:
ModelStoreManager};\n\n private constructor() {\n this.managers = {};\n }\n\n private static getInstance():
ModelStoreManagerRegistry {\n if (ModelStoreManagerRegistry.instance == null) {\n
ModelStoreManagerRegistry.instance = new ModelStoreManagerRegistry();\n }\n return
ModelStoreManagerRegistry.instance;\n }\n\n /**\n * Register a save-handler router.\n *\n * @param
saveRouter A function that maps a URL-like string onto an instance\n * of `IOHandler` with the `save` method
defined or `null`.\n *\n * static registerManager(scheme: string, manager: ModelStoreManager) {\n assert(scheme
!= null, () => 'scheme must not be undefined or null.);\n if (scheme.endsWith(URL_SCHEME_SUFFIX)) {\n
scheme = scheme.slice(0, scheme.indexOf(URL_SCHEME_SUFFIX));\n }\n assert(scheme.length > 0, () =>
'scheme must not be an empty string.);\n const registry = ModelStoreManagerRegistry.getInstance();\n assert(\n
registry.managers[scheme] == null,\n () => `A model store manager is already registered for scheme '${\n
scheme}'.`);\n registry.managers[scheme] = manager;\n }\n\n static getManager(scheme: string):
ModelStoreManager {\n const manager = this.getInstance().managers[scheme];\n if (manager == null) {\n
throw new Error(`Cannot find model manager for scheme '${scheme}'`);\n }\n return manager;\n }\n\n static
getSchemes(): string[] {\n return Object.keys(this.getInstance().managers);\n }\n}\n\n/**\n * Helper method for
parsing a URL string into a scheme and a path.\n *\n * @param url E.g., 'localStorage://my-model'\n * @returns A
dictionary with two fields: scheme and path.\n * Scheme: e.g., 'localStorage' in the example above.\n * Path: e.g.,
'my-model' in the example above.\n *\n function parseURL(url: string): {scheme: string, path: string} {\n if
(url.indexOf(URL_SCHEME_SUFFIX) === -1) {\n throw new Error(\n `The url string provided does not
contain a scheme. ` +\n `Supported schemes are: ` +\n
`${ModelStoreManagerRegistry.getSchemes().join(',')}`);\n }\n return {\n scheme:
url.split(URL_SCHEME_SUFFIX)[0],\n path: url.split(URL_SCHEME_SUFFIX)[1],\n };}\n\n\nasync function
cloneModelInternal(\n sourceURL: string, destURL: string,\n deleteSource = false):
Promise<ModelArtifactsInfo> {\n assert(\n sourceURL !== destURL,\n () => `Old path and new path are the
same: '${sourceURL}'`);\n\n const loadHandlers = IORouterRegistry.getLoadHandlers(sourceURL);\n assert(\n
loadHandlers.length > 0,\n () => `Copying failed because no load handler is found for source URL ${\n
sourceURL}.`);\n assert(\n loadHandlers.length < 2,\n () => `Copying failed because more than one
(${loadHandlers.length}) ` +\n `load handlers for source URL ${sourceURL}.`);\n const loadHandler =
loadHandlers[0];\n\n const saveHandlers = IORouterRegistry.getSaveHandlers(destURL);\n assert(\n
saveHandlers.length > 0,\n () => `Copying failed because no save handler is found for destination ` +\n
`URL ${destURL}.`);\n assert(\n saveHandlers.length < 2,\n () => `Copying failed because more than one
(${loadHandlers.length}) ` +\n `save handlers for destination URL ${destURL}.`);\n const saveHandler =
saveHandlers[0];\n\n const sourceScheme = parseURL(sourceURL).scheme;\n const sourcePath =
parseURL(sourceURL).path;\n const sameMedium = sourceScheme === parseURL(destURL).scheme;\n\n const modelArtifacts = await loadHandler.load();\n\n // If moving within the same storage medium, remove the old
model as soon as\n // the loading is done. Without doing this, it is possible that the combined\n // size of the two
models will cause the cloning to fail.\n if (deleteSource && sameMedium) {\n await
ModelStoreManagerRegistry.getManager(sourceScheme)\n .removeModel(sourcePath);\n }\n\n const
saveResult = await saveHandler.save(modelArtifacts);\n\n // If moving between mediums, the deletion is done after
the save succeeds.\n // This guards against the case in which saving to the destination medium\n // fails.\n if
(deleteSource && !sameMedium) {\n await ModelStoreManagerRegistry.getManager(sourceScheme)\n
.removeModel(sourcePath);\n }\n\n return saveResult.modelArtifactsInfo;\n }\n\n\n/**\n * List all models stored in
registered storage mediums.\n *\n * For a web browser environment, the registered mediums are Local Storage
and\n * IndexedDB.\n *\n * ```\n * // First create and save a model.\n * const model = tf.sequential();\n *
model.add(tf.layers.dense(\n * {units: 1, inputShape: [10], activation: 'sigmoid'}));\n * await
model.save('localStorage://demo/management/model1');\n *\n * // Then list existing models.\n *
console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Delete the model.\n * await
tf.io.removeModel('localStorage://demo/management/model1');\n *\n * // List models again.\n *

```



```

tf.io.removeModel('indexeddb://demo/management/model1');\n * ```\n * \n * @param sourceURL Source URL of
moving.\n * @param destURL Destination URL of moving.\n * @returns ModelArtifactsInfo of the copied model
(if and only if copying\n * is successful).\n * @throws Error if moving fails, e.g., if no model exists at
`sourceURL`, or\n * if `oldPath` and `newPath` are identical.\n * \n * @doc {\n * heading: 'Models',\n *
subheading: 'Management',\n * namespace: 'io',\n * ignoreCI: true\n * }\n * ^\n * async function moveModel(\n
sourceURL: string, destURL: string): Promise<ModelArtifactsInfo> {\n const deleteSource = true;\n return
cloneModelInternal(sourceURL, destURL, deleteSource);\n }\n }\n\nexport { moveModel, copyModel, removeModel,
listModels};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport './flags';\n\nimport {env} from './environment';\n\nimport {BrowserIndexedDB,
BrowserIndexedDBManager} from './io/indexed_db';\n\nimport {BrowserLocalStorage,
BrowserLocalStorageManager} from './io/local_storage';\n\nimport {ModelStoreManagerRegistry} from
 './io/model_management';\n\nimport {Platform} from './platform';\n\nexport class PlatformBrowser implements
Platform {\n // According to the spec, the built-in encoder can do only UTF-8 encoding.\n //
https://developer.mozilla.org/en-US/docs/Web/API/TextEncoder/TextEncoder\n private textEncoder:
TextEncoder;\n\n fetch(path: string, init?: RequestInit): Promise<Response> {\n return fetch(path, init);\n }\n\n
now(): number {\n return performance.now();\n }\n\n encode(text: string, encoding: string): Uint8Array {\n if
(encoding !== 'utf-8' && encoding !== 'utf8') {\n throw new Error(\n `Browser's encoder only supports utf-
8, but got ${encoding}`);\n }\n if (this.textEncoder == null) {\n this.textEncoder = new TextEncoder();\n
}\n return this.textEncoder.encode(text);\n }\n\n decode(bytes: Uint8Array, encoding: string): string {\n return
new TextDecoder(encoding).decode(bytes);\n }\n}\n\nif (env().get('IS_BROWSER')) {\n
env().setPlatform('browser', new PlatformBrowser());\n\n // Register LocalStorage IOHandler\n try {\n
ModelStoreManagerRegistry.registerManager(\n BrowserLocalStorage.URL_SCHEME, new
BrowserLocalStorageManager());\n } catch (err) {\n }\n\n // Register IndexedDB IOHandler\n try {\n
ModelStoreManagerRegistry.registerManager(\n BrowserIndexedDB.URL_SCHEME, new
BrowserIndexedDBManager());\n } catch (err) {\n }\n}\n", "/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {env} from './environment';\n\nimport {Platform} from './platform';\n\n// We are wrapping this within an
object so it can be stubbed by Jasmine.\n\nexport const getNodeFetch = {\n // tslint:disable-next-line:no-require-
imports\n importFetch: () => require('node-fetch')\n};\n\nexport type FetchFn = (url: string, init?: RequestInit) =>
Promise<Response>;\n\nlet systemFetch: FetchFn;\n\n// These getters and setters are for testing so we don't export a
mutable\n// variable.\n\nexport function resetSystemFetch() {\n systemFetch = null;\n}\n\nexport function
setSystemFetch(fetchFn: FetchFn) {\n systemFetch = fetchFn;\n}\n\nexport function getSystemFetch(): FetchFn {\n
return systemFetch;\n}\n\nexport class PlatformNode implements Platform {\n private textEncoder: TextEncoder;\n
// tslint:disable-next-line:no-any\n util: any;\n\n constructor() {\n // tslint:disable-next-line:no-require-
imports\n this.util = require('util');\n // According to the spec, the built-in encoder can do only UTF-8 encoding.\n //

```

```

https://developer.mozilla.org/en-US/docs/Web/API/TextEncoder/TextEncoder\n  this.textEncoder = new
this.util.TextEncoder();\n }\n\n fetch(path: string, requestInits?: RequestInit): Promise<Response> {\n if
(env().global.fetch != null) {\n  return env().global.fetch(path, requestInits);\n }\n\n if (systemFetch == null)
{\n  systemFetch = getNodeFetch.importFetch();\n }\n return systemFetch(path, requestInits);\n }\n\n now():
number {\n  const time = process.hrtime();\n  return time[0] * 1000 + time[1] / 1000000;\n }\n\n encode(text:
string, encoding: string): Uint8Array {\n  if (encoding !== 'utf-8' && encoding !== 'utf8') {\n  throw new
Error(\n    `Node built-in encoder only supports utf-8, but got ${encoding}`);\n  }\n  return
this.textEncoder.encode(text);\n }\n  decode(bytes: Uint8Array, encoding: string): string {\n  if (bytes.length ===
0) {\n  return '';\n  }\n  return new this.util.TextDecoder(encoding).decode(bytes);\n }\n}\n\nif
(env().get('IS_NODE')) {\n  env().setPlatform('node', new PlatformNode());\n }\n\n"/**\n * @license\n * Copyright
2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {TensorBuffer} from './tensor';\nimport {DataType, DataTypeMap, Rank, ShapeMap} from
'./types';\nimport * as util from './util';\n\n/**\n * Creates an empty `tf.TensorBuffer` with the specified `shape` and
`dtype`.\n *\n * The values are stored in CPU as `TypedArray`. Fill the buffer using\n * `buffer.set()`, or by
modifying directly `buffer.values`.\n *\n * When done, call `buffer.toTensor()` to get an immutable `tf.Tensor`
with\n * those values.\n *\n * ``js\n * // Create a buffer and set values at particular indices.\n * const buffer =
tf.buffer([2, 2]);\n * buffer.set(3, 0, 0);\n * buffer.set(5, 1, 0);\n *\n * // Convert the buffer back to a tensor.\n *
buffer.toTensor().print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n *
@param dtype The dtype of the buffer. Defaults to 'float32'.\n * @param values The values of the buffer as
`TypedArray`. Defaults to\n * zeros.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\n\nexport
function buffer<R extends Rank, D extends DataType = 'float32'>(\n  shape: ShapeMap[R], dtype: D = 'float32' as
D,\n  values?: DataTypeMap[D]): TensorBuffer<R, D> {\n  dtype = dtype || 'float32' as D;\n  util.assertNonNegativeIntegerDimensions(shape);\n  return new TensorBuffer<R, D>(shape, dtype,
values);\n }\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
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License.\n *

```

```

=====\n
*/\n\nimport {ENGINE} from './engine';\nimport {Cast, CastAttrs, CastInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
'./tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {DataType, TensorLike} from
'./types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Casts a `tf.Tensor` to a new
dtype.\n *\n * ``js\n * const x = tf.tensor1d([1.5, 2.5, 3]);\n * tf.cast(x, 'int32').print();\n * ```\n *\n * @param x The
input tensor to be casted.\n * @param dtype The dtype to cast the input tensor to.\n *\n * @doc {heading: 'Tensors',
subheading: 'Transformations'}\n */\n\nfunction cast_<T extends Tensor>(x: T|TensorLike, dtype: DataType): T {\n
const $x = convertToTensor(x, 'x', 'cast');\n\n // Sanity checks.\n if (!util.isValidDtype(dtype)) {\n  throw new
Error('Failed to cast to unknown dtype ${dtype}');\n }\n if (dtype === 'string' && $x.dtype !== 'string' ||\n
dtype !== 'string' && $x.dtype === 'string') {\n  throw new Error('Only strings can be casted to strings');\n }\n\n
const inputs: CastInputs = {x: $x};\n const attrs: CastAttrs = {dtype};\n\n return ENGINE.runKernel(\n  Cast,

```

inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);
export const cast = op({ cast_ });
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```
=====
*
import {ENGINE} from './engine';
import {Identity, IdentityInputs} from './kernel_names';
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';
*
Creates a new tensor with the same values and shape as the specified
tensor.
const x = tf.tensor([1, 2]);
x.clone().print();
@param x The tensor to clone.
@doc {heading: 'Tensors', subheading: 'Creation'}
function clone<T extends Tensor>(x: T|TensorLike): T {
  const $x = convertToTensor(x, 'x', 'clone', 'string_or_numeric');
  const inputs: IdentityInputs = {x: $x};
  // Note this op is called tf.identity in python. Hence the kernel name used
  // here.
  return ENGINE.runKernel(Identity, inputs as {} as NamedTensorMap);
}
export const clone = op({ clone_ });
*
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```

```
=====
*
import {Tensor} from './tensor';
*
Prints information about the `tf.Tensor` including its data.
const verbose = true;
tf.tensor2d([1, 2, 3, 4], [2, 2]).print(verbose);
@param x The tensor to be printed.
@param verbose Whether to print verbose information about the `Tensor`,
including dtype and size.
@doc {heading: 'Tensors', subheading: 'Creation'}
export function print<T extends Tensor>(x: T, verbose = false): void {
  console.log(x.toString(verbose));
}
*
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```

```
=====
*
// Required side effectful code for tfjs-core
// Set up Engine and ENV
import {getOrCreateEngine} from './engine';
getOrCreateEngine();
// Register backend-agnostic flags.
import './flags';
// Register platforms
import './platforms/platform_browser';
import './platforms/platform_node';
// Set up OpHandler
import {buffer} from './ops/buffer';
import {cast} from './ops/cast';
import {clone} from './ops/clone';
import {print} from './ops/print';
import {OpHandler, setOpHandler} from './tensor';
const opHandler: OpHandler = {
  buffer,
  cast,
  clone,
  print,
};
setOpHandler(opHandler);
*
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```

```

=====
*/\n\n/**\n * IOHandlers related to files, such as browser-triggered file downloads,\n * user-selected files in browser.\n */\n\nimport './flags';\nimport { env } from './environment';\nimport { basename, concatenateArrayBuffers, getModelArtifactsInfoForJSON } from './io_utils';\nimport { IORouter, IORouterRegistry } from './router_registry';\nimport { IOHandler, ModelArtifacts, ModelJSON, SaveResult, WeightsManifestConfig, WeightsManifestEntry } from './types';\n\nconst DEFAULT_FILE_NAME_PREFIX = 'model';\nconst DEFAULT_JSON_EXTENSION_NAME = '.json';\nconst DEFAULT_WEIGHT_DATA_EXTENSION_NAME = '.weights.bin';\n\nfunction defer<T>(f: () => T): Promise<T> {\n  return new Promise(resolve => setTimeout(resolve)).then(f);\n}\n\nexport class BrowserDownloads implements IOHandler {\n  private readonly modelTopologyFileName: string;\n  private readonly weightDataFileName: string;\n  private readonly jsonAnchor: HTMLAnchorElement;\n  private readonly weightDataAnchor: HTMLAnchorElement;\n\n  static readonly URL_SCHEME = 'downloads://';\n\n  constructor(fileNamePrefix?: string) {\n    if (!env().getBool('IS_BROWSER')) {\n      // TODO(cais): Provide info on what IOHandlers are available under the\n      // current environment.\n      throw new Error(\n        'browserDownloads() cannot proceed because the current\n        environment ' +\n        'is not a browser.');\n    }\n\n    if (fileNamePrefix.startsWith(BrowserDownloads.URL_SCHEME)) {\n      fileNamePrefix =\n        fileNamePrefix.slice(BrowserDownloads.URL_SCHEME.length);\n    }\n\n    if (fileNamePrefix == null ||\n        fileNamePrefix.length === 0) {\n      fileNamePrefix = DEFAULT_FILE_NAME_PREFIX;\n    }\n\n    this.modelTopologyFileName = fileNamePrefix + DEFAULT_JSON_EXTENSION_NAME;\n    this.weightDataFileName =\n      fileNamePrefix + DEFAULT_WEIGHT_DATA_EXTENSION_NAME;\n  }\n\n  async save(modelArtifacts: ModelArtifacts): Promise<SaveResult> {\n    if (typeof (document) === 'undefined') {\n      throw new Error(\n        'Browser downloads are not supported in ' +\n        'this environment since `document`\n        is not present');\n    }\n\n    const weightsURL = window.URL.createObjectURL(new Blob([\n      modelArtifacts.weightData, { type: 'application/octet-stream' }]);\n\n    if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n      throw new Error(\n        'BrowserDownloads.save() does not support saving model\n        topology ' +\n        'in binary formats yet.');

```

```

Error(\n      `When calling browserFiles, at least 1 file is required,` +\n      `but received ${files}`);\n  }\n  this.files = files;\n  }\n\n  async load(): Promise<ModelArtifacts> {\n    const jsonFile = this.files[0];\n    const\n    weightFiles = this.files.slice(1);\n\n    return new Promise<ModelArtifacts>((resolve, reject) => {\n      const\n      jsonReader = new FileReader();\n      jsonReader.onload = (event: Event) => {\n        // tslint:disable-next-line:no-\n        any\n        const modelJSON = JSON.parse((event.target as any).result) as ModelJSON;\n        const modelTopology\n        = modelJSON.modelTopology;\n        if (modelTopology == null) {\n          reject(new Error(\n\n          `modelTopology field is missing from file ${jsonFile.name}`));\n          return;\n        }\n        if\n        (weightFiles.length === 0) {\n          resolve({ modelTopology });\n        }\n        const weightsManifest =\n        modelJSON.weightsManifest;\n        if (weightsManifest == null) {\n          reject(new Error(\n\n          `weightManifest field is missing from file ${jsonFile.name}`));\n          return;\n        }\n        let pathToFile:\n        {[path: string]: File};\n        try {\n          pathToFile =\n          this.checkManifestAndWeightFiles(weightsManifest, weightFiles);\n        } catch (err) {\n          reject(err);\n          return;\n        }\n        const weightSpecs: WeightsManifestEntry[] = [];\n        const paths: string[] = [];\n        const perFileBuffers: ArrayBuffer[] = [];\n        weightsManifest.forEach(weightsGroup => {\n          weightsGroup.paths.forEach(path => {\n            paths.push(path);\n            perFileBuffers.push(null);\n          });\n          weightSpecs.push(...weightsGroup.weights);\n        });\n        weightsManifest.forEach(weightsGroup => {\n          weightsGroup.paths.forEach(path => {\n            const weightFileReader = new FileReader();\n            weightFileReader.onload = (event: Event) => {\n              // tslint:disable-next-line:no-any\n              const\n              weightData = (event.target as any).result as ArrayBuffer;\n              const index = paths.indexOf(path);\n              perFileBuffers[index] = weightData;\n              if (perFileBuffers.indexOf(null) === -1) {\n                const result:\n                ModelArtifacts = {\n                  modelTopology,\n                  weightSpecs,\n                  weightData:\n                  concatenateArrayBuffers(perFileBuffers),\n                  format: modelJSON.format,\n                  generatedBy:\n                  modelJSON.generatedBy,\n                  convertedBy: modelJSON.convertedBy\n                };\n                if\n                (modelJSON.signature != null) {\n                  result.signature = modelJSON.signature;\n                }\n                if\n                (modelJSON.userDefinedMetadata != null) {\n                  result.userDefinedMetadata =\n                  modelJSON.userDefinedMetadata;\n                }\n                if (modelJSON.modelInitializer != null) {\n                  result.modelInitializer = modelJSON.modelInitializer;\n                }\n                resolve(result);\n              }\n            }\n          });\n          weightFileReader.onerror = error =>\n            reject(`Failed to weights data from file of path\n            '${path}'.`);\n          weightFileReader.readAsArrayBuffer(pathToFile[path]);\n        });\n      });\n      jsonReader.onerror = error => reject(\n\n      `Failed to read model topology and weights manifest JSON` +\n      `from file '${jsonFile.name}'. BrowserFiles supports loading ` +\n      `Keras-style tf.Model artifacts only.`);\n      jsonReader.readAsText(jsonFile);\n    });\n  }\n\n  /**\n   * Check the compatibility between weights manifest and\n   * weight files.\n   */\n  private checkManifestAndWeightFiles(\n    manifest: WeightsManifestConfig, files: File[]):\n    {[path: string]: File} {\n    const basenames: string[] = [];\n    const fileNames = files.map(file =>\n    basename(file.name));\n    const pathToFile: {[path: string]: File} = {};\n    for (const group of manifest) {\n      group.paths.forEach(path => {\n        const pathBasename = basename(path);\n        if\n        (basenames.indexOf(pathBasename) !== -1) {\n          throw new Error(\n\n          `Duplicate file basename found in\n          weights manifest: ` +\n          `${pathBasename}`);\n        }\n        basenames.push(pathBasename);\n        if\n        (fileNames.indexOf(pathBasename) === -1) {\n          throw new Error(\n\n          `Weight file with basename\n          '${pathBasename}' is not provided.`);\n        }\n        pathToFile[path] =\n        files[fileNames.indexOf(pathBasename)];\n      });\n    }\n    if (basenames.length !== files.length) {\n      throw new Error(\n\n      `Mismatch in the number of files in weights manifest ` +\n      `(${basenames.length})\n      and the number of weight files provided ` +\n      `(${files.length}).`);\n    }\n    return pathToFile;\n  }\n\n  export const browserDownloadsRouter: IORouter = (url: string|string[]) => {\n    if\n    (!env().getBool('IS_BROWSER')) {\n      return null;\n    } else {\n      if (!Array.isArray(url) &&\n      url.startsWith(BrowserDownloads.URL_SCHEME)) {\n        return\n        browserDownloads(url.slice(BrowserDownloads.URL_SCHEME.length));\n      } else {\n        return null;\n      }\n    }\n  }\n  IORouterRegistry.registerSaveRouter(browserDownloadsRouter);\n\n  /**\n   * Creates an IOHandler that

```



```

(endFraction - startFraction);\n    // pass fraction as parameter to callback function.\n    onProgress(fraction);\n    return value;\n  });\n  return promise;\n  });\n\n  function checkPromises(promises: Array<Promise<{}|void>>):\n  void {\n    assert(\n      promises != null && Array.isArray(promises) && promises.length > 0,\n      () =>\n      'promises must be a none empty array');\n  }\n\n  function checkFraction(startFraction: number, endFraction:\n  number): void {\n    assert(\n      startFraction >= 0 && startFraction <= 1,\n      () => `Progress fraction must be\n      in range [0, 1], but ` +\n      `got startFraction ${startFraction}`);\n    assert(\n      endFraction >= 0 &&\n      endFraction <= 1,\n      () => `Progress fraction must be in range [0, 1], but ` +\n      `got endFraction\n      ${endFraction}`);\n    assert(\n      endFraction >= startFraction,\n      () => `startFraction must be no more than\n      endFraction, but ` +\n      `got startFraction ${startFraction} and endFraction ` +\n      ` ${endFraction}`);\n  }\n\n  return Promise.all(promises.map(registerMonitor));\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

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```

```

``js\n * // example for creating a nodejs weight loader, which reads the weight files\n * // from disk using
fs.readFileSync\n * \n * import * as fs from 'fs'\n * \n * const fetchWeightsFromDisk = (filePaths: string[]) =>\n *
filePaths.map(filePath => fs.readFileSync(filePath).buffer)\n * \n * const loadWeights =
tf.io.weightsLoaderFactory(fetchWeightsFromDisk)\n * \n * const manifest = JSON.parse(\n *
fs.readFileSync('./my_model-weights_manifest').toString()\n * )\n * const weightMap = await
loadWeights(manifest, './')\n * ``\n * @param fetchWeightsFunction The function used for fetching the weight
files.\n * @returns Weight loading function.\n * ^\nexport function weightsLoaderFactory(\n
fetchWeightsFunction: (fetchUrls: string[]) => Promise<ArrayBuffer[]>):\n (manifest: WeightsManifestConfig,\n
filePathPrefix?: string,\n weightNames?: string[]) => Promise<NamedTensorMap> {\n return async(\n
manifest: WeightsManifestConfig, filePathPrefix = ",\n weightNames?: string[]):\n
Promise<NamedTensorMap> => {\n // Collect all the groups, weights, and their relative offsets to be\n //
fetched.\n const groupIndicesToFetchMap = manifest.map(() => false);\n const groupWeightsToFetch: {\n
[group: number]: Array<{\n manifestEntry: WeightsManifestEntry; groupOffset: number;\n sizeBytes:\n
number;\n }>\n } = {};\n const weightsFound =\n weightNames != null ? weightNames.map(() => false)\n
: [];\n const allManifestWeightNames: string[] = [];\n manifest.forEach((manifestGroupConfig, groupIndex) =>\n
{\n let groupOffset = 0;\n manifestGroupConfig.weights.forEach(weightsEntry => {\n const rawDtype =\n ('quantization' in weightsEntry) ?\n weightsEntry.quantization.dtype :\n weightsEntry.dtype;\n\n
const weightsBytes = DTYPE_VALUE_SIZE_MAP[rawDtype] *\n
util.sizeFromShape(weightsEntry.shape);\n\n const enqueueWeightsForFetchingFn = () => {\n
groupIndicesToFetchMap[groupIndex] = true;\n if (groupWeightsToFetch[groupIndex] == null) {\n
groupWeightsToFetch[groupIndex] = [];\n }\n groupWeightsToFetch[groupIndex].push({\n
manifestEntry: weightsEntry,\n groupOffset,\n sizeBytes: weightsBytes\n });\n });\n\n if\n
(weightNames != null) {\n weightNames.forEach((weightName, weightIndex) => {\n if (weightName\n
=== weightsEntry.name) {\n enqueueWeightsForFetchingFn();\n weightsFound[weightIndex] =\n
true;\n }\n });\n } else {\n enqueueWeightsForFetchingFn();\n }\n\n
allManifestWeightNames.push(weightsEntry.name);\n groupOffset += weightsBytes;\n });\n });\n\n if\n
(!weightsFound.every(found => found)) {\n const weightsNotFound = weightNames.filter((_, i) =>\n
!weightsFound[i]);\n throw new Error(\n `Could not find weights in manifest with names: ` +\n
`${weightsNotFound.join(', ')}`.\n `Manifest JSON has weights with names: ` +\n
`${allManifestWeightNames.join(', ')}`);\n }\n\n // Convert the one-hot boolean groupId => shouldFetch map to\n
a list of group\n // IDs.\n const groupIndicesToFetch =\n groupIndicesToFetchMap.reduce((accumulator,\n
shouldFetch, i) => {\n if (shouldFetch) {\n accumulator.push(i);\n }\n return accumulator;\n
}, []);\n\n const fetchUrls: string[] = [];\n groupIndicesToFetch.forEach(i => {\n
manifest[i].paths.forEach(filepath => {\n const fetchUrl = filePathPrefix +\n
(!filePathPrefix.endsWith('/') ? '/' : '') + filepath;\n fetchUrls.push(fetchUrl);\n });\n });\n const buffers =\n
await fetchWeightsFunction(fetchUrls);\n\n const weightsTensorMap: NamedTensorMap = {};\n let\n
bufferIndexOffset = 0;\n groupIndicesToFetch.forEach(i => {\n const numBuffers =\n
manifest[i].paths.length;\n let groupBytes = 0;\n for (let i = 0; i < numBuffers; i++) {\n groupBytes +=\n
buffers[bufferIndexOffset + i].byteLength;\n }\n\n // Create a buffer for the whole group.\n const\n
groupBuffer = new ArrayBuffer(groupBytes);\n const groupByteBuffer = new Uint8Array(groupBuffer);\n let\n
groupByteBufferOffset = 0;\n for (let i = 0; i < numBuffers; i++) {\n const buffer = new\n
Uint8Array(buffers[bufferIndexOffset + i]);\n groupByteBuffer.set(buffer, groupByteBufferOffset);\n
groupByteBufferOffset += buffer.byteLength;\n }\n\n const weightsEntries = groupWeightsToFetch[i];\n
weightsEntries.forEach(weightsEntry => {\n const byteBuffer = groupBuffer.slice(\n
weightsEntry.groupOffset,\n weightsEntry.groupOffset + weightsEntry.sizeBytes);\n const\n
nameToTensorMap =\n decodeWeights(byteBuffer, [weightsEntry.manifestEntry]);\n for (const name in\n
nameToTensorMap) {\n weightsTensorMap[name] = nameToTensorMap[name];\n }\n });\n\n
bufferIndexOffset += numBuffers;\n });\n\n return weightsTensorMap;\n };\n\n", /**\n * @license\n *

```

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```
=====\n*\n**\n * IOHandler implementations based on HTTP requests in the web browser.\n * Uses  
[ fetch`](https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API).\n *\nimport { env } from  
 './environment';\nimport { assert } from './util';\nimport { concatenateArrayBuffers,  
getModelArtifactsInfoForJSON } from './io_utils';\nimport { IORouter, IORouterRegistry } from  
 './router_registry';\nimport { IOHandler, LoadOptions, ModelArtifacts, ModelJSON, OnProgressCallback,  
SaveResult, WeightsManifestConfig, WeightsManifestEntry } from './types';\nimport { loadWeightsFromArrayBuffer }  
 from './weights_loader';\nconst OCTET_STREAM_MIME_TYPE = 'application/octet-stream';\nconst  
JSON_TYPE = 'application/json';\nexport class HTTPRequest implements IOHandler {\n  protected readonly path:  
string;\n  protected readonly requestInit: RequestInit;\n\n  private readonly fetch: Function;\n  private readonly  
weightUrlConverter: (weightName: string) => Promise<string>;\n\n  readonly DEFAULT_METHOD = 'POST';\n\n  static readonly URL_SCHEME_REGEX = /^https?:\\/\\/;/;\n\n  private readonly weightPathPrefix: string;\n  private  
readonly onProgress: OnProgressCallback;\n\n  constructor(path: string, loadOptions?: LoadOptions) {\n    if  
(loadOptions == null) {\n      loadOptions = {};\n    }\n    this.weightPathPrefix = loadOptions.weightPathPrefix;\n    this.onProgress = loadOptions.onProgress;\n    this.weightUrlConverter = loadOptions.weightUrlConverter;\n\n    if  
(loadOptions.fetchFunc != null) {\n      assert(\n        typeof loadOptions.fetchFunc === 'function',\n        () =>  
'Must pass a function that matches the signature of ' +\n          ` fetch` (see ' +\n          'https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API');\n      this.fetch = loadOptions.fetchFunc;\n    }  
else {\n      this.fetch = env().platform.fetch;\n    }\n\n    assert(\n      path != null && path.length > 0,\n      () =>  
'URL path for http must not be null, undefined or ' +\n        'empty.';\n    )\n    if (Array.isArray(path)) {\n      assert(\n        path.length === 2,\n        () => 'URL paths for http must have a length of 2, ' +\n          `(actual  
length is ${path.length}).`;\n      )\n      this.path = path;\n\n      if (loadOptions.requestInit != null &&\n        loadOptions.requestInit.body != null) {\n        throw new Error(\n          'requestInit is expected to have no pre-  
existing body, but has one.';\n        )\n      }\n      this.requestInit = loadOptions.requestInit || {};\n    }\n\n    async  
save(modelArtifacts: ModelArtifacts): Promise<SaveResult> {\n      if (modelArtifacts.modelTopology instanceof  
ArrayBuffer) {\n        throw new Error(\n          'BrowserHTTPRequest.save() does not support saving model topology  
' +\n          'in binary formats yet.';\n        )\n      }\n      const init = Object.assign({ method: this.DEFAULT_METHOD },  
this.requestInit);\n      init.body = new FormData();\n\n      const weightsManifest: WeightsManifestConfig = [{\n        paths: ['./model.weights.bin'],\n        weights: modelArtifacts.weightSpecs,\n      }];\n      const  
modelTopologyAndWeightManifest: ModelJSON = {\n        modelTopology: modelArtifacts.modelTopology,\n        format: modelArtifacts.format,\n        generatedBy: modelArtifacts.generatedBy,\n        convertedBy:  
modelArtifacts.convertedBy,\n        weightsManifest\n      };  
if (modelArtifacts.signature != null) {\n      modelTopologyAndWeightManifest.signature = modelArtifacts.signature;\n    }\n\n    if  
(modelArtifacts.userDefinedMetadata != null) {\n      modelTopologyAndWeightManifest.userDefinedMetadata =\n        modelArtifacts.userDefinedMetadata;\n    }\n    if (modelArtifacts.modelInitializer != null) {\n      modelTopologyAndWeightManifest.modelInitializer =\n        modelArtifacts.modelInitializer;\n    }\n\n    init.body.append(\n      'model.json',\n      new Blob(\n        [JSON.stringify(modelTopologyAndWeightManifest)],\n        { type: JSON_TYPE },\n      ),\n      'model.json');\n\n    if  
(modelArtifacts.weightData != null) {\n      init.body.append(\n        'model.weights.bin',\n        new  
Blob([modelArtifacts.weightData], { type: OCTET_STREAM_MIME_TYPE },\n      ),\n      'model.weights.bin');\n    }\n\n    const response = await this.fetch(this.path, init);\n\n    if (response.ok) {\n      return {\n        modelArtifactsInfo: getModelArtifactsInfoForJSON(modelArtifacts),\n        responses: [response],\n      };  
    } else
```

```

{\n  throw new Error(\n    `BrowserHTTPRequest.save() failed due to HTTP response status ` +\n
`${response.status}.`);\n  }\n }\n\n /**\n * Load model artifacts via HTTP request(s).\n *\n * See the
documentation to `tf.io.http` for details on the saved\n * artifacts.\n *\n * @returns The loaded model artifacts (if
loading succeeds).\n *\n async load(): Promise<ModelArtifacts> {\n  const modelConfigRequest = await
this.fetch(this.path, this.requestInit);\n\n  if (!modelConfigRequest.ok) {\n    throw new Error(\n      `Request to
${this.path} failed with status code ` +\n      `${modelConfigRequest.status}. Please verify this URL points to `
+\n      `the model JSON of the model to load.`);\n  }\n\n  let modelConfig: ModelJSON;\n  try {\n
modelConfig = await modelConfigRequest.json();\n  } catch (e) {\n    let message = `Failed to parse model JSON
of response from ${this.path}.`; \n    // TODO(nsthorat): Remove this after some time when we're comfortable
that\n    // .pb files are mostly gone.\n    if (this.path.endsWith('.pb')) {\n      message += ' Your path contains a
.pb file extension. ' +\n        'Support for .pb models have been removed in TensorFlow.js 1.0 ' +\n        'in favor
of .json models. You can re-convert your Python ' +\n        'TensorFlow model using the TensorFlow.js 1.0
conversion scripts ' +\n        'or you can convert your.pb models with the `pb2json` ' +\n        'NPM script in
the tensorflow/tfjs-converter repository.';\n    } else {\n      message += ' Please make sure the server is serving
valid ' +\n        'JSON for this request.';\n    }\n    throw new Error(message);\n  }\n\n  const modelTopology =
modelConfig.modelTopology;\n  const weightsManifest = modelConfig.weightsManifest;\n  const generatedBy =
modelConfig.generatedBy;\n  const convertedBy = modelConfig.convertedBy;\n  const format =
modelConfig.format;\n  const signature = modelConfig.signature;\n  const userDefinedMetadata =
modelConfig.userDefinedMetadata;\n\n  // We do not allow both modelTopology and weightsManifest to be
missing.\n  if (modelTopology == null && weightsManifest == null) {\n    throw new Error(\n      `The JSON
from HTTP path ${this.path} contains neither model ` +\n      `topology or manifest for weights.`);\n  }\n\n  let
weightSpecs: WeightsManifestEntry[];\n  let weightData: ArrayBuffer;\n  if (weightsManifest != null) {\n
const results = await this.loadWeights(weightsManifest);\n    [weightSpecs, weightData] = results;\n  }\n\n  const
artifacts: ModelArtifacts = {\n    modelTopology,\n    weightSpecs,\n    weightData,\n    generatedBy,\n
convertedBy,\n    format\n  };\n\n  if (signature != null) {\n    artifacts.signature = signature;\n  }\n  if
(userDefinedMetadata != null) {\n    artifacts.userDefinedMetadata = userDefinedMetadata;\n  }\n\n  const
initializer = modelConfig.modelInitializer;\n  if (initializer) {\n    artifacts.modelInitializer = initializer;\n  }\n\n
return artifacts;\n }\n\n private async loadWeights(weightsManifest: WeightsManifestConfig): \n
Promise<[WeightsManifestEntry[], ArrayBuffer]> {\n  const weightPath = Array.isArray(this.path) ? this.path[1] :
this.path;\n  const [prefix, suffix] = parseUrl(weightPath);\n  const pathPrefix = this.weightPathPrefix ||
prefix;\n\n  const weightSpecs = [];\n  for (const entry of weightsManifest) {\n
weightSpecs.push(...entry.weights);\n  }\n\n  const fetchURLs: string[] = [];\n  const urlPromises:
Array<Promise<string>> = [];\n  for (const weightsGroup of weightsManifest) {\n    for (const path of
weightsGroup.paths) {\n      if (this.weightUrlConverter != null) {\n
urlPromises.push(this.weightUrlConverter(path));\n      } else {\n        fetchURLs.push(pathPrefix + path +
suffix);\n      }\n    }\n  }\n\n  if (this.weightUrlConverter) {\n    fetchURLs.push(...await
Promise.all(urlPromises));\n  }\n\n  const buffers = await loadWeightsAsArrayBuffer(fetchURLs, {\n
requestInit: this.requestInit,\n  fetchFunc: this.fetch,\n  onProgress: this.onProgress\n });\n  return
[weightSpecs, concatenateArrayBuffers(buffers)];\n }\n\n /**\n * Extract the prefix and suffix of the url, where
the prefix is the path before\n * the last file, and suffix is the search params after the last file.\n * ```\n * const url =
'http://tfhub.dev/model/1/tensorflowjs_model.pb?tfjs-format=file'\n * [prefix, suffix] = parseUrl(url)\n * // prefix =
'http://tfhub.dev/model/1/'\n * // suffix = '?tfjs-format=file'\n * ```\n * @param url the model url to be parsed.\n
*\n * \nexport function parseUrl(url: string): [string, string] {\n  const lastSlash = url.lastIndexOf('/');\n  const
lastSearchParam = url.lastIndexOf('?');\n  const prefix = url.substring(0, lastSlash);\n  const suffix =\n
lastSearchParam > lastSlash ? url.substring(lastSearchParam) : '';\n  return [prefix + '/', suffix];\n }\n\nexport function
isHTTPScheme(url: string): boolean {\n  return url.match(HTTPRequest.URL_SCHEME_REGEX) !=
null;\n }\n\nexport const httpRouter: IORouter =\n (url: string, loadOptions?: LoadOptions) => {\n  if (typeof
fetch === 'undefined' &&\n    (loadOptions == null || loadOptions.fetchFunc == null)) {\n    // `http` uses

```

```

`fetch` or `node-fetch`, if one wants to use it in\n    // an environment that is not the browser or node they have to
setup a\n    // global fetch polyfill.\n    return null;\n  } else {\n    let isHTTP = true;\n    if
(Array.isArray(url)) {\n      isHTTP = url.every(urlItem => isHTTPSscheme(urlItem));\n    } else {\n
isHTTP = isHTTPSscheme(url);\n    }\n    if (isHTTP) {\n      return http(url, loadOptions);\n    }\n  }\n
return null;\n
};\nIORouterRegistry.registerSaveRouter(httpRouter);\nIORouterRegistry.registerLoadRouter(httpRouter);\n\n/**\n
* Creates an IOHandler subtype that sends model artifacts to HTTP server.\n * An HTTP request of the
`multipart/form-data` mime type will be sent to the\n * `path` URL. The form data includes artifacts that represent
the topology\n * and/or weights of the model. In the case of Keras-style `tf.Model`, two\n * blobs (files) exist in
form-data:\n * - A JSON file consisting of `modelTopology` and `weightsManifest`.\n * - A binary weights file
consisting of the concatenated weight values.\n * These files are in the same format as the one generated by\n *
[tfjs_converter](https://js.tensorflow.org/tutorials/import-keras.html).\n *\n * The following code snippet
exemplifies the client-side code that uses this\n * function:\n *\n * ```js\n * const model = tf.sequential();\n *
model.add(\n *   tf.layers.dense({units: 1, inputShape: [100], activation: 'sigmoid'}));\n * \n * const saveResult =
await model.save(tf.io.http(\n *   'http://model-server:5000/upload', {requestInit: {method: 'PUT'}}));\n * \n *
console.log(saveResult);\n * ```\n *\n * If the default `POST` method is to be used, without any custom parameters\n
* such as headers, you can simply pass an HTTP or HTTPS URL to `model.save`:\n *\n * ```js\n * const saveResult
= await model.save('http://model-server:5000/upload');\n * ```\n *\n * The following GitHub Gist\n *
https://gist.github.com/dsmilkov/1b6046fd6132d7408d5257b0976f7864\n * implements a server based on
[flask](https://github.com/pallets/flask) that\n * can receive the request. Upon receiving the model artifacts via the
request,\n * this particular server reconstitutes instances of [Keras\n * Models](https://keras.io/models/model/) in
memory.\n *\n * @param path A URL path to the model.\n * Can be an absolute HTTP path (e.g.,\n *
'http://localhost:8000/model-upload') or a relative path (e.g.,\n * './model-upload').\n * @param requestInit
Request configurations to be used when sending\n * HTTP request to server using `fetch`. It can contain fields
such as\n * `method`, `credentials`, `headers`, `mode`, etc. See\n * https://developer.mozilla.org/en-
US/docs/Web/API/Request/Request\n * for more information. `requestInit` must not have a body, because the\n *
body will be set by TensorFlow.js. File blobs representing the model\n * topology (filename: 'model.json') and the
weights of the model (filename:\n * 'model.weights.bin') will be appended to the body. If `requestInit` has a\n *
`body`, an Error will be thrown.\n * @param loadOptions Optional configuration for the loading. It includes the\n *
following fields:\n * - weightPathPrefix Optional, this specifies the path prefix for weight\n * files, by default
this is calculated from the path param.\n * - fetchFunc Optional, custom `fetch` function. E.g., in Node.js,\n * the
`fetch` from node-fetch can be used here.\n * - onProgress Optional, progress callback function, fired
periodically\n * before the load is completed.\n * @returns An instance of `IOHandler`.\n *\n * @doc {\n *
heading: 'Models',\n * subheading: 'Loading',\n * namespace: 'io',\n * ignoreCI: true\n * }\n *\n * ^\nexport function
http(path: string, loadOptions?: LoadOptions): IOHandler {\n  return new HTTPRequest(path,
loadOptions);\n}\n\n/**\n * Deprecated. Use `tf.io.http`.\n * @param path\n * @param loadOptions\n */\nexport
function browserHTTPRequest(\n  path: string, loadOptions?: LoadOptions): IOHandler {\n  return http(path,
loadOptions);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n *\n * IOHandlers that pass through the in-memory ModelArtifacts format.\n *\n * import {IOHandler,
ModelArtifacts, SaveResult, TrainingConfig, WeightsManifestEntry} from './types';\n * class PassthroughLoader
implements IOHandler {\n *   constructor(private readonly modelArtifacts?: ModelArtifacts) {}\n *   async load():

```

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Promise<ModelArtifacts> {\n  return this.modelArtifacts;\n }\n}\n\nclass PassthroughSaver implements
IOHandler {\n  constructor(\n    private readonly saveHandler:\n      (artifacts: ModelArtifacts) =>
Promise<SaveResult>) {\n\n  async save(modelArtifacts: ModelArtifacts) {\n    return
this.saveHandler(modelArtifacts);\n  }\n}\n\n/**\n * Creates an IOHandler that loads model artifacts from
memory.\n * \n * When used in conjunction with `tf.loadLayersModel`, an instance of\n * `tf.LayersModel` (Keras-
style) can be constructed from the loaded artifacts.\n * \n * ```js\n * const model = await
tf.loadLayersModel(tf.io.fromMemory(\n *   modelTopology, weightSpecs, weightData));\n * ```\n * \n * @param
modelArtifacts a object containing model topology (i.e., parsed from\n * the JSON format).\n * @param
weightSpecs An array of `WeightsManifestEntry` objects describing the\n * names, shapes, types, and quantization
of the weight data.\n * @param weightData A single `ArrayBuffer` containing the weight data,\n * concatenated in
the order described by the weightSpecs.\n * @param trainingConfig Model training configuration. Optional.\n * \n * @returns A passthrough `IOHandler` that simply loads the provided data.\n */\nexport function fromMemory(\n
modelArtifacts: {}|ModelArtifacts, weightSpecs?: WeightsManifestEntry[],\n weightData?: ArrayBuffer,
trainingConfig?: TrainingConfig): IOHandler {\n  if (arguments.length === 1) {\n    const isModelArtifacts =\n
(modelArtifacts as ModelArtifacts).modelTopology != null ||\n      (modelArtifacts as ModelArtifacts).weightSpecs
!= null;\n    if (isModelArtifacts) {\n      return new PassthroughLoader(modelArtifacts as ModelArtifacts);\n    } else
{\n      // Legacy support: with only modelTopology.\n      // TODO(cais): Remove this deprecated API.\n
console.warn(\n        'Please call tf.io.fromMemory() with only one argument. ' +\n        'The argument should be
of type ModelArtifacts. ' +\n        'The multi-argument signature of tf.io.fromMemory() has been ' +\n        'deprecated
and will be removed in a future release.);\n      return new PassthroughLoader({modelTopology:\n
modelArtifacts as {}});\n    }\n  } else {\n    // Legacy support.\n    // TODO(cais): Remove this deprecated API.\n
console.warn(\n      'Please call tf.io.fromMemory() with only one argument. ' +\n      'The argument should be of
type ModelArtifacts. ' +\n      'The multi-argument signature of tf.io.fromMemory() has been ' +\n      'deprecated
and will be removed in a future release.);\n    return new PassthroughLoader({\n      modelTopology: modelArtifacts
as {},\n      weightSpecs,\n      weightData,\n      trainingConfig\n    });\n  }\n}\n\n/**\n * Creates an IOHandler that
passes saved model artifacts to a callback.\n * \n * ```js\n * function handleSave(artifacts) {\n *   // ... do something
with the artifacts ...\n *   return {modelArtifactsInfo: {...}, ...};\n * }\n * \n * const saveResult =
model.save(tf.io.withSaveHandler(handleSave));\n * ```\n * \n * @param saveHandler A function that accepts a
`ModelArtifacts` and returns a\n * `SaveResult`.\n */\nexport function withSaveHandler(\n  saveHandler:\n
(artifacts: ModelArtifacts) =>\n  Promise<SaveResult>): IOHandler {\n  return new
PassthroughSaver(saveHandler);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n * \n *
=====*\n\n*\n\n// Importing local_storage and indexed_db is necessary for the routers to be\n// registered.\nimport
'./indexed_db';\nimport './local_storage';\nimport {browserFiles} from './browser_files';\nimport
{browserHTTPRequest, http, isHTTPScheme} from './http';\nimport {concatenateArrayBuffers, decodeWeights,
encodeWeights, getModelArtifactsInfoForJSON} from './io_utils';\nimport {fromMemory, withSaveHandler} from
'./passthrough';\nimport {getLoadHandlers, getSaveHandlers, registerLoadRouter, registerSaveRouter} from
'./router_registry';\nimport {IOHandler, LoadHandler, LoadOptions, ModelArtifacts, ModelArtifactsInfo,\n
ModelJSON, ModelStoreManager, OnProgressCallback, RequestDetails, SaveConfig, SaveHandler, SaveResult,\n
WeightGroup, WeightsManifestConfig, WeightsManifestEntry} from './types';\nimport {loadWeights,\n
weightsLoaderFactory} from './weights_loader';\n\nexport {copyModel, listModels, moveModel, removeModel}\n
from './model_management';\n\nexport {\n  browserFiles,\n  browserHTTPRequest,\n  concatenateArrayBuffers,\n

```

decodeWeights,\n encodeWeights,\n fromMemory,\n getLoadHandlers,\n getModelArtifactsInfoForJSON,\n getSaveHandlers,\n http,\n IOHandler,\n isHTTPSscheme,\n LoadHandler,\n LoadOptions,\n loadWeights,\n ModelArtifacts,\n ModelArtifactsInfo,\n ModelJSON,\n ModelStoreManager,\n OnProgressCallback,\n registerLoadRouter,\n registerSaveRouter,\n RequestDetails,\n SaveConfig,\n SaveHandler,\n SaveResult,\n WeightGroup,\n weightsLoaderFactory,\n WeightsManifestConfig,\n WeightsManifestEntry,\n withSaveHandler\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {ENGINE} from './engine';\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes the dot product of two matrices, A * B. These must be matrices.\n *\n * @js\n * const a = tf.tensor2d([1, 2], [1, 2]);\n * const b = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * a.matMul(b).print(); // or\n * tf.matMul(a, b)\n *\n * @param a First matrix in dot product operation.\n * @param b Second matrix in dot product operation.\n * @param transposeA If true, `a` is transposed before multiplication.\n * @param transposeB If true, `b` is transposed before multiplication.\n *\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n*\nfunction matMul_<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike, transposeA = false,\n  transposeB = false): T {\n  let $a = convertToTensor(a, 'a', 'matMul');\n  let $b = convertToTensor(b, 'b', 'matMul');\n  [$a, $b] = makeTypesMatch($a, $b);\n  const inputs: BatchMatMulInputs = {a: $a, b: $b};\n  const attrs: BatchMatMulAttrs = {transposeA, transposeB};\n  return ENGINE.runKernel(\n    BatchMatMul, inputs as {\n    } as NamedTensorMap, attrs as {\n    } as NamedAttrMap);\n  }\n\nexport const matMul = op({matMul_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {ENGINE} from './engine';\nimport {OneHot, OneHotAttrs, OneHotInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Creates a one-hot `tf.Tensor`. The locations represented by `indices` take\n * value `onValue` (defaults to 1), while all other locations take value\n * `offValue` (defaults to 0). If `indices` is rank `R`, the output has rank\n * `R+1` with the last axis of size `depth`. \n *\n * @js\n * tf.oneHot(tf.tensor1d([0, 1], 'int32'), 3).print();\n *\n * @param indices `tf.Tensor` of indices with dtype `int32`.\n * @param depth The depth of the one hot dimension.\n * @param onValue A number used to fill in the output when the index matches\n * the location.\n * @param offValue A number used to fill in the output when the index does\n * not match the location.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n*\nfunction oneHot_(\n  indices: Tensor|TensorLike, depth: number, onValue = 1,\n  offValue = 0): Tensor {\n  if (depth < 2) {\n    throw new Error(`Error in oneHot: depth must be >=2, but it is ${depth}`);\n  }\n  const $indices = convertToTensor(indices, 'indices', 'oneHot', 'int32');\n  const inputs: OneHotInputs = {indices: $indices};\n  const attrs: OneHotAttrs = {depth, onValue, offValue};\n  return ENGINE.runKernel(\n    OneHot, inputs as
```

unknown as NamedTensorMap,\n attrs as unknown as NamedAttrMap);\n}\n\nexport const oneHot =
op({oneHot_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```
=====
*\n\nimport {ENGINE} from './engine';\nimport {Transpose, TransposeAttrs, TransposeInputs} from  
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport  
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport  
{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Transposes  
the `tf.Tensor`. Permutes the dimensions according to `perm`. The returned `tf.Tensor`'s dimension `i` will  
correspond to the input dimension `perm[i]`. If `perm` is not given, it is set to `[n-1...0]`, where `n` is the  
rank of the input `tf.Tensor`. Hence by default, this operation performs a regular matrix transpose on 2-D input  
`tf.Tensor`s.\n *  
js\n * const a = tf.tensor2d([1, 2, 3, 4, 5, 6], [2, 3]);\n * a.transpose().print(); // or  
tf.transpose(a)\n *  
@param x The tensor to transpose.\n * @param perm The permutation of the  
dimensions of a.\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n *\nfunction transpose_<T extends  
Tensor>(x: T|TensorLike, perm?: number[]): T {\n  const $x = convertToTensor(x, 'x', 'transpose');\n  if (perm ===  
null) {\n    perm = $x.shape.map((s, i) => i).reverse();\n  }\n  util.assert(\n    $x.rank === perm.length,\n    () =>  
`Error in transpose: rank of input ${$x.rank} must match length of perm ${perm}.`);\n  perm.forEach(axis => {\n    util.assert(\n      axis >= 0 && axis < $x.rank,\n      () => `All entries in 'perm' must be  
between 0 and ${$x.rank - 1} but got ${perm}`);\n  });\n  if ($x.rank <= 1) {\n    return $x.clone();\n  }\n  const inputs: TransposeInputs = {x: $x};\n  const attrs: TransposeAttrs = {perm};\n  return  
ENGINE.runKernel(\n    Transpose, inputs as {} as NamedTensorMap, attrs as {} as  
NamedAttrMap);\n}\n\nexport const transpose = op({transpose_});\n", "/*\n * @license\n * Copyright 2018  
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you  
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====
*\n\nimport {Tensor1D, Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport  
{TensorLike} from './types';\nimport * as util from './util';\n\nimport {cast} from './cast';\nimport {matMul} from  
 './mat_mul';\nimport {oneHot} from './one_hot';\nimport {op} from './operation';\nimport {transpose} from  
 './transpose';\n\n/**\n * Computes the confusion matrix from true labels and predicted labels.\n *  
js\n * const  
labels = tf.tensor1d([0, 1, 2, 1, 0], 'int32');\n * const predictions = tf.tensor1d([0, 2, 2, 1, 0], 'int32');\n * const  
numClasses = 3;\n * const out = tf.math.confusionMatrix(labels, predictions, numClasses);\n * out.print();\n *  
// Expected output matrix:\n * // [[2, 0, 0],\n * // [0, 1, 1],\n * // [0, 0, 1]]\n *  
@param labels The target  
labels, assumed to be 0-based integers for the classes. The shape is `[numExamples]`, where  
`numExamples` is the number of examples included.\n * @param predictions The predicted classes, assumed to be  
* 0-based integers for the classes. Must have the same shape as `labels`.\n * @param numClasses Number of all  
classes, as an integer. Its value must be larger than the largest element in `labels` and  
`predictions`.\n * @returns The confusion matrix as a int32-type 2D tensor. The value at row `r` and column `c` is the number of  
times examples of actual class `r` were predicted as class `c`.\n * @doc {heading: 'Operations', subheading:  
'Evaluation'}\n *\nfunction confusionMatrix_(\n  labels: Tensor1D|TensorLike, predictions:
```



```

Tensor1D|TensorLike,\n  numClasses: number): Tensor2D {\n  const $labels = convertToTensor(labels, 'labels',
'confusionMatrix');\n  const $predictions =\n  convertToTensor(predictions, 'predictions', 'confusionMatrix');\n  util.assert(\n    numClasses == null || numClasses > 0 && Number.isInteger(numClasses),\n    () => `If provided,
numClasses must be a positive integer, ` +\n    `but got ${numClasses}`);\n  util.assert(\n    $labels.rank ===
1,\n    () => `Expected the rank of labels to be 1, but got ${$labels.rank}`);\n  util.assert(\n    $predictions.rank
=== 1,\n    () => `Expected the rank of predictions to be 1, ` +\n    `but got ${$predictions.rank}`);\n
util.assert(\n    $labels.shape[0] === $predictions.shape[0],\n    () => `Mismatch in the number of examples: ` +\n
    `${$labels.shape[0]} vs. ${$predictions.shape[0]}. ` +\n    `Labels and predictions should have the same
number of elements.`);\n  util.assert(\n    numClasses > 0 && Number.isInteger(numClasses),\n    () =>
`numClasses is required to be a positive integer, but got ` +\n    `${numClasses}`);\n  // TODO(cais): In the
future, if oneHot supports tensors inputs for\n  // `numClasses`, `confusionMatrix` can make `numClasses`
optional.\n\n  const oneHotLabels = oneHot(cast($labels, 'int32'), numClasses) as Tensor2D;\n  const
oneHotPredictions =\n  oneHot(cast($predictions, 'int32'), numClasses) as Tensor2D;\n  const oneHotLabelsT:
Tensor2D = transpose(oneHotLabels);\n  const product: Tensor2D = matMul(oneHotLabelsT, oneHotPredictions);\n
return cast(product, 'int32');\n}\n\nexport const confusionMatrix = op({confusionMatrix_});\n", "/*\n * @license\n
 * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

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=====\n
*\n\n/*\n * Exports under the tf.math.* namespace.\n *\nimport { confusionMatrix } from
'./ops/confusion_matrix';\n\nexport { confusionMatrix};\n", "/*\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { Tensor3D } from './tensor';\nimport { inferShape } from './tensor_util_env';\nimport { TensorLike3D }
from './types';\nimport { DataType } from './types';\nimport { assertNonNull } from './util';\nimport { makeTensor }
from './tensor_ops_util';\n\n/*\n * Creates rank-3 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The
same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor3d` as it makes
the code more readable.\n *\n * ``js\n * // Pass a nested array.\n * tf.tensor3d([[[[1], [2]], [[3], [4]]]]).print();\n * ``\n
*\n * ``js\n * // Pass a flat array and specify a shape.\n * tf.tensor3d([1, 2, 3, 4], [2, 2, 1]).print();\n * ``\n *\n
@param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n
*\n * @param shape The shape of the tensor. If not provided, it is inferred from\n * `values`.\n * @param dtype The
data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *\nexport function tensor3d(\n  values:
TensorLike3D, shape?: [number, number, number],\n  dtype?: DataType): Tensor3D {\n  assertNonNull(values);\n
if (shape != null && shape.length !== 3) {\n    throw new Error('tensor3d() requires shape to have three numbers');\n
}\n  const inferredShape = inferShape(values, dtype);\n  if (inferredShape.length !== 3 && inferredShape.length !==
1) {\n    throw new Error(\n      'tensor3d() requires values to be number[][][] or flat/TypedArray');\n  }\n  if
(inferredShape.length === 1 && shape == null) {\n    throw new Error(\n      'tensor3d() requires shape to be
provided when `values` ' +\n      `are a flat array`);\n  }\n  return makeTensor(values, shape, inferredShape, dtype)
as Tensor3D;\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the 'License');\n * you may not use this file except in compliance with the

```

License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {FromPixels, FromPixelsAttrs, FromPixelsInputs} from './kernel_names';\nimport {getKernel, NamedAttrMap} from './kernel_registry';\nimport {Tensor, Tensor2D, Tensor3D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {PixelData, TensorLike} from './types';\nimport {cast} from './cast';\nimport {op} from './operation';\nimport {tensor3d} from './tensor3d';\n\nlet fromPixels2DContext:\nCanvasRenderingContext2D;\n\n/**\n * Creates a `tf.Tensor` from an image.\n *\n * @param image A new ImageData(1, 1);\n * image.data[0] = 100;\n * image.data[1] = 150;\n * image.data[2] = 200;\n * image.data[3] = 255;\n *\n * @param pixels The input image to construct the tensor from. The\n * supported image types are all 4-channel. You can also pass in an image\n * object with following attributes:\n * {data: Uint8Array; width: number; height: number}\n *\n * @param numChannels The number of channels of the output tensor. A\n * numChannels value less than 4 allows you to ignore channels. Defaults to\n * 3 (ignores alpha channel of input image).\n *\n * @doc {heading: 'Browser', namespace: 'browser', ignoreCI: true}\n */\nfunction fromPixels_(\n  pixels:\n  PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n  HTMLVideoElement|ImageBitmap,\n  numChannels = 3): Tensor3D {\n  // Sanity checks.\n  if (numChannels > 4) {\n    throw new Error('Cannot construct Tensor with more than 4 channels from pixels.);\n  }\n  if (pixels == null) {\n    throw new Error('pixels passed to tf.browser.fromPixels() can not be null');\n  }\n  let isPixelData = false;\n  let isImageData = false;\n  let isVideo = false;\n  let isImage = false;\n  let isCanvasLike = false;\n  let isImageBitmap = false;\n  if ((pixels as PixelData).data instanceof Uint8Array) {\n    isPixelData = true;\n  } else if (\n    typeof (ImageData) !== 'undefined' && pixels instanceof ImageData) {\n    isImageData = true;\n  } else if (\n    typeof (HTMLVideoElement) !== 'undefined' &&\n    pixels instanceof HTMLVideoElement) {\n    isVideo = true;\n  } else if (\n    typeof (HTMLImageElement) !== 'undefined' &&\n    pixels instanceof HTMLImageElement) {\n    isImage = true;\n  } // tslint:disable-next-line: no-any\n  } else if ((pixels as any).getContext != null) {\n    isCanvasLike = true;\n  } else if (\n    typeof (ImageBitmap) !== 'undefined' &&\n    pixels instanceof ImageBitmap) {\n    isImageBitmap = true;\n  } else {\n    throw new Error(\n      'pixels passed to tf.browser.fromPixels() must be either an '\n      + 'HTMLVideoElement, HTMLImageElement, HTMLCanvasElement, ImageData'\n      + ' in browser, or OffscreenCanvas, ImageData in webworker'\n      + ' or {data: Uint32Array, width: number, height: number},'\n      + ' but was ${pixels as {}}.constructor.name);\n  }\n  if (isVideo) {\n    const HAVE_CURRENT_DATA_READY_STATE = 2;\n    if (isVideo &&\n      (pixels as HTMLVideoElement).readyState <\n        HAVE_CURRENT_DATA_READY_STATE) {\n      throw new Error(\n        'The video element has not loaded data yet. Please wait for '\n        + 'loadeddata` event on the <video> element.);\n    }\n  }\n  // If the current backend has 'FromPixels' registered, it has a more\n  // efficient way of handling pixel uploads, so we call that.\n  const kernel = getKernel(FromPixels, ENGINE.backendName);\n  if (kernel != null) {\n    const inputs: FromPixelsInputs = {pixels};\n    const attrs: FromPixelsAttrs = {numChannels};\n    return ENGINE.runKernel(\n      FromPixels, inputs as {} as NamedTensorMap,\n      attrs as {} as NamedAttrMap);\n  }\n  const [width, height] = isVideo ?\n    [pixels as HTMLVideoElement).videoWidth,\n    (pixels as HTMLVideoElement).videoHeight\n  ]:\n    [pixels.width, pixels.height];\n  let vals: Uint8ClampedArray|Uint8Array;\n  if (isCanvasLike) {\n    vals =\n      // tslint:disable-next-line: no-any\n      (pixels as any).getContext('2d').getImageData(0, 0, width, height).data;\n  } else if (isImageData || isPixelData) {\n    vals = (pixels as PixelData | ImageData).data;\n  } else if (isImage || isVideo || isImageBitmap) {\n    if (fromPixels2DContext == null) {\n      fromPixels2DContext = document.createElement('canvas').getContext('2d');\n    }\n    fromPixels2DContext.canvas.width = width;\n  }\n}
```

```

fromPixels2DContext.canvas.height = height;\n  fromPixels2DContext.drawImage(\n    pixels as
HTMLVideoElement, 0, 0, width, height);\n  vals = fromPixels2DContext.getImageData(0, 0, width,
height).data;\n }\n let values: Int32Array;\n if (numChannels === 4) {\n  values = new Int32Array(vals);\n } else
{\n  const numPixels = width * height;\n  values = new Int32Array(numPixels * numChannels);\n  for (let i = 0;
i < numPixels; i++) {\n    for (let channel = 0; channel < numChannels; ++channel) {\n      values[i *
numChannels + channel] = vals[i * 4 + channel];\n    }\n  }\n }\n const outShape: [number, number, number] =
[height, width, numChannels];\n return tensor3d(values, outShape, 'int32');\n}\n\n/**\n * Draws a `tf.Tensor` of
pixel values to a byte array or optionally a\n * canvas.\n * When the dtype of the input is 'float32', we assume
values in the range\n * [0-1]. Otherwise, when input is 'int32', we assume values in the range\n * [0-255].\n * Returns a promise that resolves when the canvas has been drawn to.\n * @param img A rank-2 or rank-3 tensor.
If rank-2, draws grayscale. If\n * rank-3, must have depth of 1, 3 or 4. When depth of 1, draws\n * grayscale.
When depth of 3, we draw with the first three components of\n * the depth dimension corresponding to r, g, b and
alpha = 1. When depth of\n * 4, all four components of the depth dimension correspond to r, g, b, a.\n * @param
canvas The canvas to draw to.\n * @doc {heading: 'Browser', namespace: 'browser'}\n */\nexport async function
toPixels(\n  img: Tensor2D|Tensor3D|TensorLike,\n  canvas?: HTMLCanvasElement):
Promise<Uint8ClampedArray> {\n  let $img = convertToTensor(img, 'img', 'toPixels');\n  if (!(img instanceof
Tensor)) {\n    // Assume int32 if user passed a native array.\n    const originalImgTensor = $img;\n    $img =
cast(originalImgTensor, 'int32');\n    originalImgTensor.dispose();\n  }\n  if ($img.rank !== 2 && $img.rank !== 3)
{\n    throw new Error(\n      `toPixels only supports rank 2 or 3 tensors, got rank ${$img.rank}.`);\n  }\n  const
[height, width] = $img.shape.slice(0, 2);\n  const depth = $img.rank === 2 ? 1 : $img.shape[2];\n  if (depth > 4 ||
depth === 2) {\n    throw new Error(\n      `toPixels only supports depth of size ` +\n      `1, 3 or 4 but got
${depth}`);\n  }\n  if ($img.dtype !== 'float32' && $img.dtype !== 'int32') {\n    throw new Error(\n
`Unsupported type for toPixels: ${$img.dtype}.` +\n      ` Please use float32 or int32 tensors.`);\n  }\n  const data
= await $img.data();\n  const multiplier = $img.dtype === 'float32' ? 255 : 1;\n  const bytes = new
Uint8ClampedArray(width * height * 4);\n  for (let i = 0; i < height * width; ++i) {\n    const rgba = [0, 0, 0,
255];\n    for (let d = 0; d < depth; d++) {\n      const value = data[i * depth + d];\n      if ($img.dtype ===
'float32') {\n        if (value < 0 || value > 1) {\n          throw new Error(\n            `Tensor values for a float32 Tensor
must be in the ` +\n            `range [0 - 1] but encountered ${value}.`);\n        }\n      } else if ($img.dtype ===
'int32') {\n        if (value < 0 || value > 255) {\n          throw new Error(\n            `Tensor values for a int32 Tensor
must be in the ` +\n            `range [0 - 255] but encountered ${value}.`);\n        }\n      }\n      if (depth === 1) {\n
        rgba[0] = value * multiplier;\n        rgba[1] = value * multiplier;\n        rgba[2] = value * multiplier;\n      } else
{\n        rgba[d] = value * multiplier;\n      }\n      const j = i * 4;\n      bytes[j + 0] = Math.round(rgba[0]);\n
      bytes[j + 1] = Math.round(rgba[1]);\n      bytes[j + 2] = Math.round(rgba[2]);\n      bytes[j + 3] =
Math.round(rgba[3]);\n    }\n    if (canvas != null) {\n      canvas.width = width;\n      canvas.height = height;\n      const
ctx = canvas.getContext('2d');\n      const imageData = new ImageData(bytes, width, height);\n      ctx.putImageData(imageData, 0, 0);\n    }\n    if ($img !== img) {\n      $img.dispose();\n    }\n    return bytes;\n  }\n}\n\nexport
const fromPixels = op({fromPixels_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */\n\n
=====\n\n\n*\nimport {TensorInfo} from '../kernel_registry';\nimport {computeStrides, sizeFromShape} from '../util';\n\n/**\n * Validate gather nd inputs.\n * @param tensor The tensor contains the source values.\n * @param indices The
tensor contains the indices to slice the source.\n * @returns [resultShape, numUpdates, sliceSize, strides]\n */\nexport function prepareAndValidate(tensor: TensorInfo, indices: TensorInfo):\n  [number[], number, number,

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number[] {\n  const tensorRank = tensor.shape.length;\n  const indicesRank = indices.shape.length;\n  if
(tensorRank < 1) {\n    throw new Error(\n      'tf.gatherND() expects the input to be rank 1 or higher,' +\n      ` but
the rank was ${tensorRank}.`);\n  }\n  if (indicesRank < 1) {\n    throw new Error(\n      'tf.gatherND() expects the
indices to be rank 1 or higher,' +\n      ` but the rank was ${indicesRank}.`);\n  }\n  if (indices.dtype !== 'int32') {\n
throw new Error(\n    'tf.gatherND() expects the indices to be int32 type,' +\n    ` but the dtype was
${indices.dtype}.`);\n  }\n  if (indices.shape[indicesRank - 1] > tensorRank) {\n    throw new Error(\n      'index
innermost dimension length must be <= tensor rank; saw: ' +\n      `${indices.shape[indicesRank - 1]} vs.
${tensorRank}`);\n  }\n  if (sizeFromShape(tensor.shape) === 0) {\n    throw new Error(\n      'Requested more
than 0 entries, but input is empty.' +\n      ` Input shape: ${tensor.shape}.`);\n  }\n  const indicesShape =
indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n  // The result shape is\n  //
indices.shape[:-1] + params.shape[indices.shape[-1]:]\n  let nResult = 1;\n  for (let i = 0; i < indicesShape.length - 1;
++i) {\n    nResult *= indicesShape[i];\n  }\n  const inputShape = tensor.shape;\n  const resultShape =
indicesShape.slice();\n  resultShape.pop();\n  let sliceSize = 1;\n  for (let i = sliceRank; i < tensorRank; ++i) {\n
sliceSize *= inputShape[i];\n  resultShape.push(inputShape[i]);\n  }\n  const strides =\n  [...computeStrides(tensor.shape).map(stride => stride / sliceSize),\n  1].slice(0, sliceRank);\n  return
[resultShape, nResult, sliceSize, strides];\n}\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {TensorInfo} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {computeStrides,
sizeFromShape} from './util';\n\n/**\n * Check whether updates.shape = indices.shape[:batchDim] +\n *
shape[sliceDim:]\n * @param x The input tensor.\n */\nexport function validateUpdateShape(\n  shape:
number[], indices: Tensor, updates: Tensor) {\n  const sliceDim = (indices.rank > 1) ? indices.shape[indices.rank -
1] : 1;\n  const batchDim = (indices.rank > 1) ? indices.rank - 1 : 1;\n  const shapeError = 'Must have
updates.shape = indices.shape[:batchDim] + '\n    ` shape[sliceDim:], got updates.shape: ${updates.shape}` +\n
`, indices.shape: ${indices.shape}, shape: ${shape}` +\n    ` , sliceDim: ${sliceDim}, and batchDim:
${batchDim}.`;\n  if (updates.rank < batchDim) {\n    throw new Error(shapeError + ` update.rank <
${batchDim}.`);\n  }\n  if (shape.length < sliceDim + (updates.rank - batchDim)) {\n    throw new Error(\n
shapeError +\n    ` Output shape length < ${sliceDim + (updates.rank - batchDim)}`);\n  }\n  if (updates.rank !==
batchDim + shape.length - sliceDim) {\n    throw new Error(\n      shapeError + ` update.rank != ${batchDim +
shape.length - sliceDim}`);\n  }\n  for (let d = 0; d < batchDim; ++d) {\n    if (updates.shape[d] !== indices.shape[d])
{\n    throw new Error(\n      shapeError +\n      ` updates.shape[${d}] (${updates.shape[d]}) !=
indices.shape[${d}] (${indices.shape[d]}.`);\n    }\n  }\n  for (let d = 0; d < updates.rank - batchDim;
++d) {\n    if (updates.shape[d + batchDim] !== shape[d + sliceDim]) {\n    throw new Error(\n      shapeError
+\n      ` updates.shape[${d + batchDim}] (${updates.shape[d + batchDim]}) != shape[${d +
batchDim}] (${shape[d + batchDim]}.`);\n    }\n  }\n}\n\nexport interface ScatterShapeInfo {\n
sliceRank: number;\n numUpdates: number;\n sliceSize: number;\n strides: number[];\n outputSize:
number;\n}\n\n/**\n * Validate scatter nd inputs.\n * @param update The tensor contains the update values.\n *
@param indices The tensor contains the indices for the update values.\n * @param shape The shape of the output
tensor.\n */\nexport function validateInput(\n  updates: Tensor, indices: Tensor, shape: number[]) {\n  if
(indices.rank < 1) {\n    throw new Error(\n      'tf.scatterND() expects the indices to be rank 1 or higher,' +\n
` but the rank was ${indices.rank}.`);\n  }\n  if (updates.rank < 1) {\n    throw new Error(\n      'tf.scatterND() expects
the updates to be rank 1 or higher,' +\n      ` but the rank was ${updates.rank}.`);\n  }\n  if (indices.dtype !==
'int32') {\n    throw new Error(`The dtype of 'indices' should be int32, but got dtype: ${\n    indices.dtype}`);\n  }\n

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}\n if (shape.length < 1) {\n   throw new Error(`Output rank must be greater or equal to 1, but got shape:
${shape}`);\n }\n\n if (shape.length === 0) {\n   if (indices.size === 0) {\n     throw new Error(`Indices specified
for empty output. indices shape: ${\n     indices.shape}`);\n   }\n   if (updates.size === 0) {\n     throw new
Error(`Updates specified for empty output. updates shape: ${\n     updates.shape}`);\n   }\n }\n\n
validateUpdateShape(shape, indices, updates);\n}\n\n/**\n * Calculate the shape information for the output.\n *\n * @param update The tensor contains the update values.\n * @param indices The tensor contains the indices for the
update values.\n * @param shape The shape of the output tensor.\n *\n * @returns ScatterShapeInfo\n */\nexport
function calculateShapes(\n  updates: TensorInfo, indices: TensorInfo,\n  shape: number[]): ScatterShapeInfo {\n
  // Calculate the number of dimensions in indices\n  const indicesRank = indices.shape.length;\n  const sliceRank =
(indicesRank > 1) ? indices.shape[indicesRank - 1] : 1;\n\n  // Calculate the number of elements that make up each
slice of our updated\n  // tensor. This allows us to work with flattened tensors and copy over whole\n  // slices at a
time.\n  const totalNd = shape.length;\n\n  let sliceSize = 1;\n  for (let i = sliceRank; i < totalNd; ++i) {\n    sliceSize
*= shape[i];\n  }\n\n  const safeSliceDim = (sliceRank < 1) ? 1 : sliceRank;\n  const numUpdates =
sizeFromShape(indices.shape) / safeSliceDim;\n\n  const strides = [...computeStrides(shape.slice(0, sliceRank)),
1];\n  const outputSize = sizeFromShape(shape);\n  return {sliceRank, numUpdates, sliceSize, strides,
outputSize};\n}\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*/\n\nimport {TensorInfo} from './kernel_registry';\nimport * as util from './util';\n\nexport type SliceInfo = {\n
nonStrided: boolean,\n $begin: number[],\n $end: number[],\n $strides: number[],\n size: number[],\n newShape:
number[],\n outShape: number[]\n};\n\nexport function assertParamsValid(\n  input: TensorInfo, begin: number[],
size: number[]): void {\n  const inputRank = input.shape.length;\n  util.assert(\n    inputRank === begin.length,\n
() => `Error in slice${inputRank}D: Length of begin ${begin} must ` +\n    `match the rank of the array
(${inputRank}).`);\n  util.assert(\n    inputRank === size.length,\n    () => `Error in slice${inputRank}D: Length
of size ${size} must ` +\n    `match the rank of the array (${inputRank}).`);\n\n  for (let i = 0; i < inputRank;\n
++i) {\n    util.assert(\n      begin[i] + size[i] <= input.shape[i],\n      () => `Error in slice${inputRank}D:\n
begin[${i}] + size[${i}] ` +\n      `(${begin[i] + size[i]}) would overflow input.shape[${i}] (${input.shape[i]})`);\n
  }\n}\n\n/**\n * Converts a binary mask to an array of axes. Used in stridedSlice().\n *\n * @export\n function
maskToAxes(mask: number): number[] {\n  const axes = [];\n  let axis = 0;\n  while (mask > 0) {\n    if
(mask & 1) {\n      axes.push(axis);\n    }\n    mask /= 2;\n    axis++;\n  }\n  return axes;\n}\n\n/**\n * Computes the
output shape given the strided slice params.\n *\n * @export\n function computeOutShape(\n  begin: number[], end:
number[], strides: number[]): number[] {\n  const size = [];\n  for (let axis = 0; axis < begin.length; axis++) {\n
size[axis] = Math.ceil((end[axis] - begin[axis]) / strides[axis]);\n  }\n  return size;\n}\n\n// Creates full selection at
the elided dimensions. If the dimension matches\n// the ellipsis mask, override the current stride value. Otherwise,
insert.\nexport function stridesWithElidedDims(\n  strides: number[], ellipsisInsertionIndex: number,\n  numElidedAxes: number,\n  inputShape: number[]): number[] {\n  const newStrides = [...strides];\n  for (let i =
newStrides.length; i < inputShape.length; i++) {\n    newStrides.push(1);\n  }\n  for (let i = 0; i < numElidedAxes;\n
i++) {\n    if (i === 0) {\n      newStrides[ellipsisInsertionIndex] = 1;\n    } else {\n      newStrides.splice(\n
ellipsisInsertionIndex, 0 /* num elements to delete */, 1 /* element to add */);\n      newStrides.pop();\n    }\n
  }\n  return newStrides;\n}\n\nfunction unnormalizeAxis(\n  ellipsisInsertionIndex: number, numElidedAxes:
number,\n  normalizedAxis: number): number {\n  if (normalizedAxis <= ellipsisInsertionIndex) {\n    return
normalizedAxis;\n  }\n  return normalizedAxis - (numElidedAxes - 1);\n}\n\nfunction
getElidedAxes(numElidedAxes: number, ellipsisInsertionIndex: number) {\n  const elidedAxes = [];\n  for (let i = 0;

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i < numElidedAxes; i++) {\n  elidedAxes.push(ellipsisInsertionIndex + i);\n } \n return elidedAxes;\n}\n\n//
Normalize the start, end and strides.\nexport function getNormalizedAxes(\n  inputShape: number[], ellipsisAxes:
number[], numInterpolatedAxes: number,\n  begin: number[], end: number[], strides: number[], beginMask:
number,\n  endMask: number,\n  ellipsisMask: number): {begin: number[], end: number[], strides: number[]} {\n
const inputRank = inputShape.length;\n let normalizedBegin = new Array(inputRank),\n   normalizedEnd = new
Array(inputRank),\n   normalizedStrides = new Array(inputRank);\n if (ellipsisAxes.length &&
numInterpolatedAxes > 0) {\n  const fullIndex = ellipsisAxes[0];\n   // The ellipsis applies to the masked index
as well as any dimensions\n   // that are interpolated.\n   const numElidedAxes = numInterpolatedAxes + 1;\n
normalizedBegin = startIndicesWithElidedDims(\n   beginMask, fullIndex, numElidedAxes, begin,
inputShape);\n   normalizedEnd = stopIndicesWithElidedDims(\n   endMask, fullIndex, numElidedAxes, end,
inputShape);\n   normalizedStrides =\n   stridesWithElidedDims(strides, fullIndex, numElidedAxes,
inputShape);\n } else {\n  for (let axis = 0; axis < inputRank; axis++) {\n   normalizedBegin[axis] =
startForAxis(\n   beginMask, begin, strides, inputShape, axis, ellipsisMask);\n   normalizedEnd[axis] =\n
stopForAxis(endMask, end, strides, inputShape, axis, ellipsisMask);\n   normalizedStrides[axis] =
stridesForAxis(strides, axis, ellipsisMask);\n  }\n }\n return {\n  begin: normalizedBegin,\n  end:
normalizedEnd,\n  strides: normalizedStrides\n };}\n\n// Creates full selection at the elided dimensions. If the
dimension matches\n// the ellipsis mask, override the current start value. Otherwise, insert.\nexport function
startIndicesWithElidedDims(\n  beginMask: number, ellipsisInsertionIndex: number, numElidedAxes: number,\n  originalBegin: number[], inputShape: number[]): number[] {\n  const newIndices = [...inputShape];\n  const
elidedAxes = getElidedAxes(numElidedAxes, ellipsisInsertionIndex);\n  for (let axis = 0; axis <
newIndices.length; axis++) {\n   if (elidedAxes.indexOf(axis) > -1) {\n    newIndices[axis] = 0;\n   } else {\n
const originalAxis =\n   unnormalizeAxis(ellipsisInsertionIndex, numElidedAxes, axis);\n   let originalValue
= originalBegin[originalAxis];\n   if (beginMask & 1 << originalAxis) {\n    originalValue = 0;\n   }\n
newIndices[axis] = originalValue;\n  }\n }\n return newIndices;\n}\n\n// Creates full selection at the elided
dimensions. If the dimension matches\n// the ellipsis mask, override the current stop value. Otherwise,
insert.\nexport function stopIndicesWithElidedDims(\n  endMask: number, ellipsisInsertionIndex: number,
numElidedAxes: number,\n  originalEnd: number[], inputShape: number[]): number[] {\n  const newIndices =
[...inputShape];\n  const elidedAxes = getElidedAxes(numElidedAxes, ellipsisInsertionIndex);\n  for (let axis = 0;
axis < newIndices.length; axis++) {\n   if (elidedAxes.indexOf(axis) > -1) {\n    newIndices[axis] =
Number.MAX_SAFE_INTEGER;\n   } else {\n    const originalAxis =\n   unnormalizeAxis(ellipsisInsertionIndex, numElidedAxes, axis);\n    let originalValue =
originalEnd[originalAxis];\n    if (endMask & 1 << originalAxis) {\n    originalValue =
Number.MAX_SAFE_INTEGER;\n    }\n    newIndices[axis] = originalValue;\n   }\n }\n }\n for (let i = 0; i <
newIndices.length; i++) {\n  // Handle negative indices\n  const axisSize = inputShape[i];\n  if (newIndices[i] <
0) {\n   newIndices[i] += axisSize;\n  }\n  newIndices[i] = util.clamp(0, newIndices[i], inputShape[i]);\n }\n
return newIndices;\n}\n\nexport function stridesForAxis(\n  strides: number[], axis: number, ellipsisMask:
number): number {\n  let stride = strides[axis];\n  if (ellipsisMask & (1 << axis) || stride == null) {\n   stride = 1;\n
}\n return stride;\n}\n\nexport function startForAxis(\n  beginMask: number, startIndices: number[], strides:
number[],\n  inputShape: number[], axis: number, ellipsisMask: number): number {\n  // Begin with the specified
index\n  let start = startIndices[axis];\n  const stride = strides[axis] || 1;\n  // Check the axis bit from right of
masked axes, or the begin index is not set\n  // for the axis.\n  if (beginMask & 1 << axis || ellipsisMask & 1 << axis
|| start == null) {\n   if (stride > 0) {\n    // Forward iteration - use the first element. These values will get\n    //
clamped below (Note: We could have set them to 0 and axis_size-1, but\n    // use lowest() and max() to maintain
symmetry with StopForAxis())\n    start = Number.MIN_SAFE_INTEGER;\n   } else {\n    // Backward iteration
- use the last element.\n    start = Number.MAX_SAFE_INTEGER;\n   }\n }\n }\n // Handle negative indices\n
const axisSize = inputShape[axis];\n if (start < 0) {\n  start += axisSize;\n }\n // Clamping\n start =
util.clamp(0, start, axisSize - 1);\n return start;\n}\n\nexport function stopForAxis(\n  endMask: number,
stopIndices: number[], strides: number[],\n  inputShape: number[], axis: number, ellipsisMask: number): number

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{\n // Begin with the specified index\n let stop = stopIndices[axis];\n const stride = strides[axis] || 1;\n // Check
the axis bit from right of masked axes, or if the stop index is not\n // set for this axis.\n if (endMask & (1 << axis) ||
ellipsisMask & (1 << axis) || stop === null) {\n   if (stride > 0) {\n     // Forward iteration - use the last element.
These values will get\n     // clamped below\n     stop = Number.MAX_SAFE_INTEGER;\n   } else {\n     //
Backward iteration - use the first element.\n     stop = Number.MIN_SAFE_INTEGER;\n   }\n }\n // Handle
negative indices\n const axisSize = inputShape[axis];\n if (stop < 0) {\n   stop += axisSize;\n }\n // Clamping\n
// Because the end index points one past the last element, we need slightly\n // different clamping ranges depending
on the direction.\n if (stride > 0) {\n   // Forward iteration\n   stop = util.clamp(0, stop, axisSize);\n } else {\n   //
Backward iteration\n   stop = util.clamp(-1, stop, axisSize - 1);\n }\n return stop;\n}\n\n/**\n * Returns true if the
slice occupies a continuous set of elements in the\n * 'flat' space.\n */\nexport function isSliceContinuous(\n  shape:
number[], begin: number[], size: number[]) {\n  // Index of the first axis that has size > 1.\n  let firstNonOneAxis =
size.length;\n  for (let i = 0; i < size.length; i++) {\n    if (size[i] > 1) {\n      firstNonOneAxis = i;\n      break;\n    }\n  }\n  for (let i = firstNonOneAxis + 1; i < size.length; i++) {\n    if (begin[i] > 0 || size[i] !== shape[i]) {\n      return
false;\n    }\n  }\n  return true;\n}\n\nexport function computeFlatOffset(begin: number[], strides: number[]): number
{\n  let flatOffset = begin.length > 0 ? begin[begin.length - 1] : 1;\n  for (let i = 0; i < begin.length - 1; i++) {\n
flatOffset += begin[i] * strides[i];\n }\n  return flatOffset;\n}\n\nexport function parseSliceParams(\n  x:
TensorInfo, begin: number|number[], size?: number|number[]) {\n  // The following logic allows for more
ergonomic calls.\n  let begin_: number[];\n  const xRank = x.shape.length;\n  if (typeof begin === 'number') {\n
begin_ = [begin, ...new Array(xRank - 1).fill(0)];\n } else if (begin.length < xRank) {\n   begin_ =
begin.concat(new Array(xRank - begin.length).fill(0));\n } else {\n   begin_ = begin.slice();\n }\n
begin_.forEach(d => {\n   util.assert(\n     d !== -1, () => 'slice() does not support negative begin indexing.);\n
});\n  let size_: number[];\n  if (size === null) {\n   size_ = new Array(xRank).fill(-1);\n } else if (typeof size ===
'number') {\n   size_ = [size, ...new Array(xRank - 1).fill(-1)];\n } else if (size.length < xRank) {\n   size_ =
size.concat(new Array(xRank - size.length).fill(-1));\n } else {\n   size_ = size;\n }\n  size_ = size_.map((d, i) =>
{\n    if (d >= 0) {\n      return d;\n    } else {\n      util.assert(\n        d === -1,\n        () => `Negative size values
should be exactly -1 but got ` +\n          `${d} for the slice() size at index ${i}.`);\n      return x.shape[i] -
begin_[i];\n    }\n  });\n  return [begin_, size_];\n}\n\nexport function sliceInfo(\n  xShape: number[], begin:
number[], end: number[], strides: number[],\n  beginMask: number, endMask: number, ellipsisMask: number,\n  newAxisMask: number, shrinkAxisMask: number): SliceInfo {\n  // make a copy because it may be modified further
down.\n  let $begin = begin.slice();\n  let $end = end.slice();\n  let $strides = strides;\n  if (strides === null) {\n
$strides = new Array($begin.length);\n }\n  const ellipsisAxes = maskToAxes(ellipsisMask);\n  if
(ellipsisAxes.length > 1) {\n    throw new Error('Multiple ellipses in slice is not allowed.);\n }\n  if (ellipsisMask
!== 0 && newAxisMask !== 0) {\n    throw new Error(\n      'Using both ellipsisMask and newAxisMask is not yet
supported.);\n }\n  if (ellipsisMask !== 0 && shrinkAxisMask !== 0) {\n    throw new Error(\n      'Using both
ellipsisMask and shrinkAxisMask is not yet supported.);\n }\n  const numInterpolatedAxes = xShape.length -
$begin.length;\n  // Expand the dims of x based on the newAxisMask.\n  const expandAxes =
maskToAxes(newAxisMask);\n  const newShape = xShape.slice();\n  expandAxes.forEach(axis => {\n
  $begin[axis] = 0;\n  $end[axis] = 1;\n  newShape.splice(axis, 0, 1);\n });\n  const {\n    begin:
normalizedBegin,\n    end: normalizedEnd,\n    strides: normalizedStrides\n } =\n    getNormalizedAxes(\n
newShape, ellipsisAxes, numInterpolatedAxes, $begin, $end, $strides,\n    beginMask, endMask,
ellipsisMask);\n  $begin = normalizedBegin;\n  $end = normalizedEnd;\n  $strides = normalizedStrides;\n  const
shrinkAxes = maskToAxes(shrinkAxisMask);\n  // Adjust the ends based on the shrink mask.\n
shrinkAxes.forEach(axis => {\n    $end[axis] = $begin[axis] + 1;\n    $strides[axis] = 1;\n });\n  // Figure out the
output shape.\n  const size = computeOutShape($begin, $end, $strides);\n  // Remove the axes based on
shrinkMask.\n  const outShape = size.filter((_, axis) => shrinkAxes.indexOf(axis) === -1);\n  const nonStrided =
$strides.every(v => v === 1);\n  return {nonStrided, $begin, $end, $strides, size, newShape,
outShape};\n}\n\n"/>**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the

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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {assert} from './util';\n\n/**\n * Types to support JSON-esque data structures internally.\n *\n * Internally ConfigDict's use camelCase keys and values where the\n * values are class names to be instantiated. On the python side, these\n * will be snake_case. Internally we allow Enums into the values for better\n * type safety, but these need to be converted to raw primitives (usually\n * strings) for round-tripping with python.\n *\n * toConfig returns the TS-friendly representation. model.toJSON() returns\n * the pythonic version as that's the portable format. If you need to\n * python-ify a non-model level toConfig output, you'll need to use a\n * convertTsToPythonic from serialization_utils in -Layers.\n *\n * ^\nexport declare type ConfigDictValue =\nboolean | number | string | null | ConfigDictArray | ConfigDict;\nexport declare interface ConfigDict {\n[key:\nstring]: ConfigDictValue;\n}\nexport declare interface ConfigDictArray extends Array<ConfigDictValue>\n{\n}\n\n/**\n * Type to represent the class-type of Serializable objects.\n *\n * Ie the class prototype with access to the constructor and any\n * static members/methods. Instance methods are not listed here.\n *\n * Source for this idea: https://stackoverflow.com/a/43607255\n *\n * ^\nexport declare type SerializableConstructor<T extends\nSerializable> = {\n // tslint:disable-next-line:no-any\n new (...args: any[]): T; className: string; fromConfig:\nFromConfigMethod<T>;\n};\nexport declare type FromConfigMethod<T extends Serializable> =\n(cls:\nSerializableConstructor<T>, config: ConfigDict) => T;\n\n/**\n * Serializable defines the serialization contract.\n *\n * TFJS requires serializable classes to return their className when asked\n * to avoid issues with minification.\n *\n * ^\nexport abstract class Serializable {\n /**\n * Return the class name for this class to use in serialization contexts.\n *\n * Generally speaking this will be the same thing that constructor.name\n * would have returned. However, the class name needs to be robust\n * against minification for serialization/deserialization to work properly.\n *\n * There's also places such as initializers.VarianceScaling, where\n * implementation details between different languages led to different\n * class hierarchies and a non-leaf node is used for serialization purposes.\n *\n * ^\n getClassName(): string {\n return (this.constructor as\nSerializableConstructor<Serializable>).className;\n }\n\n /**\n * Return all the non-weight state needed to serialize this object.\n *\n * ^\n abstract getConfig(): ConfigDict;\n\n /**\n * Creates an instance of T from a ConfigDict.\n *\n * This works for most descendants of serializable. A few need to\n * provide special handling.\n *\n * @param cls A Constructor for the class to instantiate.\n *\n * @param config The Configuration for the object.\n *\n * ^\n /** @nocollapse *\n static fromConfig<T extends Serializable>(\n cls:\nSerializableConstructor<T>, config: ConfigDict): T {\n return new cls(config);\n }\n}\n\n/**\n * Maps string keys to class constructors.\n *\n * Used during (de)serialization from the cross-language JSON format, which\n * requires the class name in the serialization format matches the class\n * names as used in Python, should it exist.\n *\n * ^\nexport class SerializationMap {\n private static instance: SerializationMap;\n classNameMap: {\n[className: string]:\n[SerializableConstructor<Serializable>, FromConfigMethod<Serializable>]\n };\n\n private constructor() {\n this.classNameMap = {};\n }\n\n /**\n * Returns the singleton instance of the map.\n *\n * ^\n static getMap(): SerializationMap {\n if (SerializationMap.instance == null) {\n SerializationMap.instance =\nnew SerializationMap();\n }\n return SerializationMap.instance;\n }\n\n /**\n * Registers the class as serializable.\n *\n * ^\n static register<T extends Serializable>(cls: SerializableConstructor<T>) {\n\n SerializationMap.getMap().classNameMap[cls.className] =\n[cls, cls.fromConfig];\n }\n}\n\n/**\n * Register a class with the serialization map of TensorFlow.js.\n *\n * This is often used for registering custom Layers, so they can be\n * serialized and deserialized.\n *\n * Example:\n *\n * ```js\n * class MyCustomLayer extends tf.layers.Layer {\n * static className = 'MyCustomLayer';\n *\n * constructor(config) {\n * super(config);\n * }\n *\n * }\n *\n * tf.serialization.registerClass(MyCustomLayer);\n *\n * ```\n *\n * @param cls The class to be registered. It must have a public static member\n * called `className` defined and the value must be a non-
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empty string.\n * \n * @doc {heading: 'Models', subheading: 'Serialization', ignoreCI: true}\n * \n\nexport function
registerClass<T extends Serializable>(\n   cls: SerializableConstructor<T>) {\n   assert(\n     cls.className !=
null,\n     () => `Class being registered does not have the static className ` +\n       `property defined.`);\n   assert(\n     typeof cls.className === 'string',\n     () => `className is required to be a string, but got type ` +\n       typeof cls.className);\n   assert(\n     cls.className.length > 0,\n     () => `Class being registered has an empty-
string as its className, ` +\n       `which is disallowed.`);\n   \n   SerializationMap.register(cls);\n   \n}\n\n"/**\n *
@license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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===== \n
*\n\nimport {ENGINE} from './engine';\nimport {inferShape} from './tensor_util_env';\nimport {RecursiveArray,
TensorLike, TypedArray} from './types';\nimport {arraysEqual, encodeString, flatten, isString, isTypedArray} from
 './util';\n\nconst TEST_EPSILON_FLOAT32 = 1e-3;\n\nexport const TEST_EPSILON_FLOAT16 = 1e-1;\n\nexport
function expectArraysClose(\n   actual: TypedArray|number|RecursiveArray<number>,\n   expected:
TypedArray|number|RecursiveArray<number>, epsilon?: number) {\n   if (epsilon == null) {\n     epsilon =
testEpsilon();\n   }\n   return expectArraysPredicate(\n     actual, expected, (a, b) => areClose(a as number, b as
number, epsilon));\n   \n}\n\nexport function testEpsilon() {\n   return ENGINE.backend.floatPrecision() === 32 ?
TEST_EPSILON_FLOAT32 :\n                                     TEST_EPSILON_FLOAT16;\n   \n}\n\nfunction
expectArraysPredicate(\n   actual: TensorLike, expected: TensorLike,\n   predicate: (a: {}, b: {}) => boolean) {\n
   let checkClassType = true;\n   if (isTypedArray(actual) || isTypedArray(expected)) {\n     checkClassType =
false;\n   }\n   if (isTypedArray(actual) && isTypedArray(expected)) {\n     checkClassType = true;\n   }\n   if
(checkClassType)\n   {\n     const aType = actual.constructor.name;\n     const bType = expected.constructor.name;\n     if (aType !==
bType) {\n       throw new Error(\n         `Arrays are of different type. Actual: ${aType}. ` +\n         `Expected:
${bType}`);\n     }\n   }\n   if (Array.isArray(actual) && Array.isArray(expected)) {\n     const actualShape =
inferShape(actual);\n     const expectedShape = inferShape(expected);\n     if (!arraysEqual(actualShape,
expectedShape)) {\n       throw new Error(\n         `Arrays have different shapes. ` +\n         `Actual:
[${actualShape}]. Expected: [${expectedShape}]`);\n     }\n   }\n   \n   const actualFlat =\n     isTypedArray(actual) ?
actual : flatten(actual as RecursiveArray<number>);\n   const expectedFlat = isTypedArray(expected) ?\n
expected :\n     flatten(expected as RecursiveArray<number>);\n   \n   if (actualFlat.length !== expectedFlat.length)\n   {\n     throw new Error(\n       `Arrays have different lengths actual: ${actualFlat.length} vs ` +\n       `expected:
${expectedFlat.length}. ` +\n       `Actual: [${actualFlat}]. ` +\n       `Expected: [${expectedFlat}].`);\n   }\n   for
(let i = 0; i < expectedFlat.length; ++i) {\n     const a = actualFlat[i];\n     const e = expectedFlat[i];\n     if
(!predicate(a, e)) {\n       throw new Error(\n         `Arrays differ: actual[${i}] = ${a}, expected[${i}] = ${e}. ` +\n
         `Actual: [${actualFlat}]. ` +\n         `Expected: [${expectedFlat}].`);\n     }\n   }\n   \n}\n\nexport
interface DoneFn\n {\n   (): void;\n   fail: (message?: Error|string) => void;\n   \n}\n\nexport function
expectPromiseToFail(fn: () =>
Promise<{}>, done: DoneFn): void {\n   fn().then(() => done.fail(), () => done());\n   \n}\n\nexport function
expectArraysEqual(actual: TensorLike, expected: TensorLike) {\n   const exp = typeof expected === 'string' ||
typeof\n   expected === 'number' ||\n     typeof expected === 'boolean' ?\n     [expected] as number[] :\n     expected as
number[];\n   if (isString(actual) || isString((actual as string[])[0]) ||\n     isString(expected) ||
isString((expected as\n   string[])[0])) {\n     // tslint:disable-next-line: triple-equals\n     return expectArraysPredicate(actual,
exp, (a, b) => a\n   === b);\n   }\n   return expectArraysPredicate(\n     actual, expected, (a, b) => areClose(a as number, b as
number,\n   0));\n   \n}\n\nexport function expectNumbersClose(a: number, e: number, epsilon?: number) {\n   if (epsilon ==
null)\n   {\n     epsilon = testEpsilon();\n   }\n   if (!areClose(a, e, epsilon)) {\n     throw new Error(`Numbers differ:
actual ===\n   ${a}, expected === ${e}`);\n   }\n   \n}\n\nfunction areClose(a: number, e: number, epsilon: number):
boolean {\n   if\n   (!isFinite(a) && !isFinite(e)) {\n     return true;\n   }\n   if (isNaN(a) || isNaN(e) || Math.abs(a - e) >
epsilon) {\n

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return false;\n } \n return true;\n}\n\nexport function expectValuesInRange(\n  actual: TypedArray|number[], low:
number, high: number) {\n  for (let i = 0; i < actual.length; i++) {\n    if (actual[i] < low || actual[i] > high) {\n
throw new Error(\n      `Value out of range:${actual[i]} low: ${low}, high: ${high}`);\n    }\n  }\n}\n\nexport
function expectArrayBuffersEqual(\n  actual: ArrayBuffer, expected: ArrayBuffer) {\n  // Safari & Jasmine don't
like comparing ArrayBuffers directly. Wrapping in\n  // a Float32Array solves this issue.\n  expect(new
Float32Array(actual)).toEqual(new Float32Array(expected));\n}\n\n/** Encodes strings into utf-8 bytes. */\nexport
function encodeStrings(a: RecursiveArray<{}>):\n  RecursiveArray<Uint8Array> {\n  for (let i = 0; i < (a as
Array<{}>).length; i++) {\n    const val = a[i];\n    if (Array.isArray(val)) {\n      encodeStrings(val);\n    } else {\n
a[i] = encodeString(val as string);\n    }\n  }\n  return a as RecursiveArray<Uint8Array>;\n}\n\n"/** @license See
the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.1.0';\nexport
{version};\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

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===== \n
*\n\nimport {KernelBackend} from './backends/backend';\nimport {ENGINE, Engine, MemoryInfo, ProfileInfo,
ScopeFn, TimingInfo} from './engine';\nimport {env} from './environment';\nimport {Platform} from
 './platforms/platform';\nimport {setDeprecationWarningFn, Tensor} from './tensor';\nimport {TensorContainer}
from './tensor_types';\nimport {getTensorsInContainer} from './tensor_util';\n\n/**\n * Enables production mode
which disables correctness checks in favor of\n * performance.\n *\n * @doc {heading: 'Environment'}\n *\nexport
function enableProdMode(): void {\n  env().set('PROD', true);\n}\n\n/**\n * Enables debug mode which will log
information about all executed kernels:\n * the elapsed time of the kernel execution, as well as the rank, shape, and\n
* size of the output tensor.\n *\n * Debug mode will significantly slow down your application as it will\n *
download the result of every operation to the CPU. This should not be used in\n * production. Debug mode does not
affect the timing information of the kernel\n * execution as we do not measure download time in the kernel
execution time.\n *\n * See also: `tf.profile`, `tf.memory`.\n *\n * @doc {heading: 'Environment'}\n *\nexport
function enableDebugMode(): void {\n  env().set('DEBUG', true);\n}\n\n/** Globally disables deprecation warnings
*\nexport function disableDeprecationWarnings(): void {\n
env().set('DEPRECATION_WARNINGS_ENABLED', false);\n  console.warn(`TensorFlow.js deprecation
warnings have been disabled.`);\n}\n\n/** Warn users about deprecated functionality. *\nexport function
deprecationWarn(msg: string) {\n  if (env().getBool('DEPRECATION_WARNINGS_ENABLED')) {\n
console.warn(\n    msg + ' You can disable deprecation warnings with '+\n
'tf.disableDeprecationWarnings().');\n  }\n}\n\nsetDeprecationWarningFn(deprecationWarn);\n\n/**\n * Dispose all
variables kept in backend engine.\n *\n * @doc {heading: 'Environment'}\n *\nexport function disposeVariables():
void {\n  ENGINE.disposeVariables();\n}\n\n/**\n * It returns the global engine that keeps track of all tensors and
backends.\n *\n * @doc {heading: 'Environment'}\n *\nexport function engine(): Engine {\n  return
ENGINE;\n}\n\n/**\n * Returns memory info at the current time in the program. The result is an\n * object with the
following properties:\n *\n * - `numBytes`: Number of bytes allocated (undisposed) at this time.\n * - `numTensors`:
Number of unique tensors allocated.\n * - `numDataBuffers`: Number of unique data buffers allocated\n *
(undisposed) at this time, which is the number of tensors\n * (e.g. `a.reshape(newShape)` makes a new Tensor that
shares the same\n * data buffer with `a`).\n * - `unreliable`: True if the memory usage is unreliable. See `reasons`
when\n * `unreliable` is true.\n * - `reasons`: `string[]`, reasons why the memory is unreliable, present if\n *
`unreliable` is true.\n *\n * WebGL Properties:\n * - `numBytesInGPU`: Number of bytes allocated (undisposed) in
the GPU only at\n * this time.\n *\n * @doc {heading: 'Performance', subheading: 'Memory'}\n *\nexport
function memory(): MemoryInfo {\n  return ENGINE.memory();\n}\n\n/**\n * Executes the provided function `f`

```

and returns a promise that resolves with information about the function's memory use:

- `newBytes`: the number of new bytes allocated
- `newTensors`: the number of new tensors created
- `peakBytes`: the peak number of bytes allocated
- `kernels`: an array of objects for each kernel involved that reports their input and output shapes, number of bytes used, and number of new tensors created.
- `kernelNames`: an array of unique strings with just the names of the kernels in the `kernels` array.

```

js
const profile = await
tf.profile(() => {
  const x = tf.tensor1d([1, 2, 3]);
  let x2 = x.square();
  x2.dispose();
  x2 =
x.square();
  x2.dispose();
  return x;
});
console.log(`newBytes: ${profile.newBytes}`);
console.log(`newTensors: ${profile.newTensors}`);
console.log(`byte usage over all kernels:
${profile.kernels.map(k => k.totalBytesSnapshot)}`);
@doc {heading: 'Performance',
subheading: 'Profile'}
export function profile(f: () => (TensorContainer | Promise<TensorContainer>)):
Promise<ProfileInfo> {
  return ENGINE.profile(f);
}
/n/n/**
 * Executes the provided function `fn` and after it
 * is executed, cleans up all intermediate tensors allocated by `fn` except those returned by `fn`.
 * `fn` must not
 * return a Promise (async functions not allowed). The returned result can be a complex object.
 * Using this
 * method helps avoid memory leaks. In general, wrap calls to operations in `tf.tidy` for automatic memory
 * cleanup.
 * NOTE: Variables do not get cleaned up when inside a tidy(). If you want to dispose variables,
 * please use `tf.disposeVariables` or call `dispose` directly on variables.
js
// y = 2 ^ 2 + 1
const
y = tf.tidy(() => {
  // a, b, and one will be cleaned up when the tidy ends.
  const one = tf.scalar(1);
  const a = tf.scalar(2);
  const b = a.square();
  console.log(`numTensors (in tidy): ` +
tf.memory().numTensors);
  // The value returned inside the tidy function will return // through the tidy,
  in this case to the variable y.
  return b.add(one);
});
console.log(`numTensors (outside tidy): ` +
tf.memory().numTensors);
y.print();
@param nameOrFn The name of the closure, or the function
to execute.
 * If a name is provided, the 2nd argument should be the function.
 * If debug mode is on, the
 * timing and the memory usage of the function will be tracked and displayed on the console using the provided
 * name.
 * @param fn The function to execute.
@doc {heading: 'Performance', subheading: 'Memory'}
export function tidy<T extends TensorContainer>(
  nameOrFn: string|ScopeFn<T>, fn?: ScopeFn<T>): T {
  return ENGINE.tidy(nameOrFn, fn);
}
/n/n/**
 * Disposes any `tf.Tensor`s found within the provided object.
 * @param container an object that may be a `tf.Tensor` or may directly contain `tf.Tensor`s, such as a
 * `Tensor[]` or `{key: Tensor, ...}`. If the object is not a `tf.Tensor` or does not contain `Tensors`, nothing
 * happens. In general it is safe to pass any object here, except that `Promise`s are not supported.
@doc
{heading: 'Performance', subheading: 'Memory'}
export function dispose(container: TensorContainer) {
  const tensors = getTensorsInContainer(container);
  tensors.forEach(tensor => tensor.dispose());
}
/n/n/**
 * Keeps a `tf.Tensor` generated inside a `tf.tidy` from being disposed automatically.
js
let b;
const
y = tf.tidy(() => {
  const one = tf.scalar(1);
  const a = tf.scalar(2);
  // b will not be cleaned up
  by the tidy. a and one will be cleaned up // when the tidy ends.
  b = tf.keep(a.square());
  console.log(`numTensors (in tidy): ` + tf.memory().numTensors);
  // The value returned inside the tidy
  function will return // through the tidy, in this case to the variable y.
  return b.add(one);
});
console.log(`numTensors (outside tidy): ` + tf.memory().numTensors);
console.log('y:');
y.print();
console.log('b:');
b.print();
@param result The tensor to keep from being disposed.
@doc
{heading: 'Performance', subheading: 'Memory'}
export function keep<T extends Tensor>(result: T): T {
  return ENGINE.keep(result);
}
/n/n/**
 * Executes `f` and returns a promise that resolves with timing
 * information.
 * The result is an object with the following properties:
 * - `wallMs`: Wall execution time.
 * - `kernelMs`: Kernel execution time, ignoring data transfer. If using the WebGL backend and the query timer
 * extension is not available, this will return an error object.
 * - On `WebGL` The following additional properties
 * exist:
 * - `uploadWaitMs`: CPU blocking time on texture uploads.
 * - `downloadWaitMs`: CPU blocking time
 * on texture downloads (readPixels).
js
const
x = tf.randomNormal([20, 20]);
const
time = await
tf.time(() => x.matMul(x));
console.log(`kernelMs: ${time.kernelMs}, wallTimeMs: ${time.wallMs}`);
@param f The function to execute and time.
@doc {heading: 'Performance', subheading:
'Timing'}
export function time(f: () => void): Promise<TimingInfo> {
  return ENGINE.time(f);
}
/n/n/**

```

* Sets the backend (cpu, webgl, wasm, etc) responsible for creating tensors and executing operations on those tensors. Returns a promise that resolves to a boolean if the backend initialization was successful. Note this disposes the current backend, if any, as well as any tensors associated with it. A new backend is initialized, even if it is of the same type as the previous one. @param backendName The name of the backend. Currently supports `webgl|cpu` in the browser, `tensorflow` under node.js (requires tfjs-node), and `wasm` (requires tfjs-backend-wasm). @doc {heading: 'Backends'} ^next export function setBackend(backendName: string): Promise<boolean> { return ENGINE.setBackend(backendName); } ^next Returns a promise that resolves when the currently selected backend (or the highest priority one) has initialized. Await this promise when you are using a backend that has async initialization. @doc {heading: 'Backends'} ^next export function ready(): Promise<void> { return ENGINE.ready(); } ^next Returns the current backend name (cpu, webgl, etc). The backend is responsible for creating tensors and executing operations on those tensors. @doc {heading: 'Backends'} ^next export function getBackend(): string { return ENGINE.backendName; } ^next Removes a backend and the registered factory. @doc {heading: 'Backends'} ^next export function removeBackend(name: string): void { ENGINE.removeBackend(name); } ^next Finds the backend registered under the provided name. Returns null if the name is not in the registry, or the registration hasn't finished yet. ^next export function findBackend(name: string): KernelBackend { return ENGINE.findBackend(name); } ^next Finds the backend factory registered under the provided name. Returns a function that produces a new backend when called. Returns null if the name is not in the registry. ^next export function findBackendFactory(name: string): () => KernelBackend | Promise<KernelBackend> { return ENGINE.findBackendFactory(name); } ^next Registers a global backend. The registration should happen when importing a module file (e.g. when importing `backend_webgl.ts`), and is used for modular builds (e.g. custom tfjs bundle with only webgl support). @param factory The backend factory function. When called, it should return a backend instance, or a promise of an instance. @param priority The priority of the backend (higher = more important). In case multiple backends are registered, the priority is used to find the best backend. Defaults to 1. @return False if there is already a registered backend under this name, true if not. @doc {heading: 'Backends'} ^next export function registerBackend(name: string, factory: () => KernelBackend | Promise<KernelBackend>, priority = 1): boolean { return ENGINE.registerBackend(name, factory, priority); } ^next Gets the current backend. If no backends have been initialized, this will attempt to initialize the best backend. Will throw an error if the highest priority backend has async initialization, in which case, you should call `await tf.ready()` before running other code. @doc {heading: 'Backends'} ^next export function backend(): KernelBackend { return ENGINE.backend; } ^next Sets the global platform. @param platformName The name of this platform. @param platform A platform implementation. ^next export function setPlatform(platformName: string, platform: Platform) { env().setPlatform(platformName, platform); } ^next @license Copyright 2020 Google LLC. All Rights Reserved. Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License. ^next

```

=====
^next import {ENGINE} from './engine';
import {Add, AddInputs} from './kernel_names';
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {makeTypesMatch} from './tensor_util';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';
^next Adds two `tf.Tensor`s element-wise, A + B. Supports broadcasting.
```js
const a = tf.tensor1d([1, 2, 3, 4]);
const b = tf.tensor1d([10, 20, 30, 40]);
a.add(b).print(); // or
tf.add(a, b)
```
^next Broadcast add a with b.
const a = tf.scalar(5);
const b = tf.tensor1d([10, 20, 30, 40]);
a.add(b).print(); // or tf.add(a, b)
^next @param a The first `tf.Tensor` to add. @param

```

b The second `tf.Tensor` to add. Must have the same type as `a`.
 @doc {heading: 'Operations', subheading: 'Arithmetic'}
 ^\nfunction add_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let \$a = convertToTensor(a, 'a', 'add');\n let \$b = convertToTensor(b, 'b', 'add');\n [\$a, \$b] = makeTypesMatch(\$a, \$b);\n\n const inputs: AddInputs = {a: \$a, b: \$b};\n\n return ENGINE.runKernel(Add, inputs as { } as NamedTensorMap);\n}\n\nexport const add = op({ add_ });\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n
*\n\nimport {ENGINE} from './engine';\nimport {FloorDiv, FloorDivInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A / B. Supports broadcasting.\n * The result is rounded with floor function.\n *\n * `js`\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n * a.floorDiv(b).print(); // or tf.div(a, b)\n *\n * ``\n *\n * `js`\n * // Broadcast div a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(2);\n * a.floorDiv(b).print(); // or tf.floorDiv(a, b)\n *\n * ``\n *\n * @param a The first tensor as the numerator.\n * @param b The second tensor as the denominator. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction floorDiv_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'floorDiv');\n let $b = convertToTensor(b, 'b', 'floorDiv');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: FloorDivInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(FloorDiv, inputs as { } as NamedTensorMap);\n}\n\nexport const floorDiv = op({ floorDiv_ });\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\n\nimport {ENGINE} from './engine';\nimport {RealDiv, RealDivInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {floorDiv} from './floorDiv';\nimport {op} from './operation';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A / B. Supports broadcasting.\n *\n * `js`\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n * a.div(b).print(); // or tf.div(a, b)\n *\n * ``\n *\n * `js`\n * // Broadcast div a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(2);\n * a.div(b).print(); // or tf.div(a, b)\n *\n * ``\n *\n * @param a The first tensor as the numerator.\n * @param b The second tensor as the denominator. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction div_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'div');\n let $b = convertToTensor(b, 'b', 'div');\n [$a, $b] = makeTypesMatch($a, $b);\n\n if ($a.dtype === 'int32' && $b.dtype === 'int32') {\n return floorDiv($a, $b);\n }\n\n const inputs: RealDivInputs = {a: $a, b: $b};\n const attrs = {};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n return ENGINE.runKernel(RealDiv, inputs as { } as NamedTensorMap, attrs as T);\n}\n\nexport const div = op({ div_ });\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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```
=====  
*\n\nimport {ENGINE} from './engine';\nimport {Multiply, MultiplyInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Multiplies two `tf.Tensor`s element-wise, A * B. Supports broadcasting.\n *\n * We also expose `tf.mulStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.tensor1d([2, 3, 4, 5]);\n * a.mul(b).print(); // or tf.mul(a, b)\n * ```\n *\n * // Broadcast mul a with b.\n * const a = tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.scalar(5);\n * a.mul(b).print(); // or tf.mul(a, b)\n * ```\n *\n * @param a The first tensor to multiply.\n * @param b The second tensor to multiply. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction mul<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let $a = convertToTensor(a, 'a', 'mul');\n  let $b = convertToTensor(b, 'b', 'mul');\n  [$a, $b] = makeTypesMatch($a, $b);\n  const inputs: MultiplyInputs = {a: $a, b: $b};\n  return ENGINE.runKernel(Multiply, inputs as {} as NamedTensorMap);\n}\n\nexport const mul = op({mul_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====  
*\n\nimport {ENGINE} from './engine';\nimport {Abs, AbsInputs, ComplexAbs, ComplexAbsInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes absolute value element-wise: `abs(x)`\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n * x.abs().print(); // or tf.abs(x)\n * ```\n *\n * @param x The input `tf.Tensor`.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction abs<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'abs');\n  if ($x.dtype === 'complex64') {\n    const inputs: ComplexAbsInputs = {x: $x};\n    return ENGINE.runKernel(ComplexAbs, inputs as {} as NamedTensorMap);\n  } else {\n    const inputs: AbsInputs = {x: $x};\n    return ENGINE.runKernel(Abs, inputs as {} as NamedTensorMap);\n  }\n}\n\nexport const abs = op({abs_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====  
*\n\nimport {ENGINE} from './engine';\nimport {Acos, AcosInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes acos of the input `tf.Tensor` element-wise: `acos(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n * x.acos().print(); // or tf.acos(x)\n * ```\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',\n
```

```

subheading: 'Basic math')\n *\nfunction acos_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =
convertToTensor(x, 'x', 'acos');\n  const inputs: AcosInputs = {x: $x};\n\n  return ENGINE.runKernel(Acos, inputs
as { } as NamedTensorMap);\n}\n\nexport const acos = op({acos_});\n"}\n\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Acosh, AcoshInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n**\n * Computes
the inverse hyperbolic cos of the input `tf.Tensor` element-wise:\n * `acosh(x)`\n *\n * ```\n * const x =
tf.tensor1d([10, 1, 3, 5.7]);\n *\n * x.acosh().print(); // or tf.acosh(x)\n *\n * ```\n * @param x The input tensor.\n *\n *
@doc {heading: 'Operations', subheading: 'Basic math'}\n *\nfunction acosh_<T extends Tensor>(x:
T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'acosh');\n  const inputs: AcoshInputs = {x: $x};\n\n  return
ENGINE.runKernel(Acosh, inputs as { } as NamedTensorMap);\n}\n\nexport const acosh = op({acosh_});\n"}\n\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {AddN, AddNInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from
 './operation';\n\n**\n * Adds a list of `tf.Tensor`'s element-wise, each with the same shape and dtype.\n *\n *
```\n * const a = tf.tensor1d([1, 2]);\n *\n * const b = tf.tensor1d([3, 4]);\n *\n * const c = tf.tensor1d([5, 6]);\n *\n *
tf.addN([a, b, c]).print();\n *\n * ```\n * @param tensors A list of tensors with the same shape and dtype.\n *
@doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction addN_<T extends Tensor>(tensors: Array<T|TensorLike>): T
{\n util.assert(\n Array.isArray(tensors),\n () => "The argument passed to tf.addN() must be a list of
tensors");\n util.assert(\n tensors.length >= 1,\n () => `Must pass at least one tensor to tf.addN(), but got ` +\n
 `${tensors.length}`);\n\n const $tensors =\n tensors.map((t, i) => convertToTensor(t, `tensors${i}`,
'addN'));\n\n const firstTensor = $tensors[0];\n $tensors.forEach(t => {\n if (t.dtype !== firstTensor.dtype) {\n
throw new Error(\n 'All tensors passed to tf.addN() must have the same dtype');\n }\n });\n\n $tensors.forEach(t => {\n if (!util.arraysEqual(t.shape, firstTensor.shape)) {\n
throw new Error(\n 'All tensors passed to tf.addN() must have the same shape');\n }\n });\n\n const inputs: AddNInputs = $tensors;\n\n return ENGINE.runKernel(AddN, inputs as { } as NamedTensorMap);\n}\n\nexport const addN =
op({addN_});\n"}\n\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {ENGINE} from './engine';\nimport {All, AllAttrs, AllInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Computes the logical and of elements across dimensions of a
`tf.Tensor`.\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims` is true, the rank
of the `tf.Tensor` is reduced by 1 for each entry in `axes`. If `keepDims` is true, the reduced dimensions are
retained with length 1. If `axes` has no entries, all dimensions are reduced, and an `tf.Tensor` with a single
element is returned.\n * \n * \n * \n * const x = tf.tensor1d([1, 1, 1], 'bool');\n * \n * x.all().print(); // or tf.all(x)\n *
\n * \n * \n * const x = tf.tensor2d([1, 1, 0, 0], [2, 2], 'bool');\n * \n * const axis = 1;\n * x.all(axis).print(); // or
tf.all(x, axis)\n * \n * \n * \n * @param x The input tensor. Must be of dtype bool.\n * @param axis The dimension(s)
to reduce. By default it reduces all dimensions.\n * @param keepDims If true, retains reduced dimensions
with size 1.\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction all<T extends
Tensor>(\n x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x =
convertToTensor(x, 'x', 'all', 'bool');\n const inputs: AllInputs = {x: $x};\n const attrs: AllAttrs = {axis,
keepDims};\n return ENGINE.runKernel(\n All, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\nexport const all = op({all_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {ENGINE} from './engine';\nimport {Any, AnyAttrs, AnyInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Computes the logical or of elements across dimensions of a
`tf.Tensor`.\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims` is true, the rank
of the `tf.Tensor` is reduced by 1 for each entry in `axes`. If `keepDims` is true, the reduced dimensions are
retained with length 1. If `axes` has no entries, all dimensions are reduced, and an `tf.Tensor` with a single
element is returned.\n * \n * \n * \n * const x = tf.tensor1d([1, 1, 1], 'bool');\n * \n * x.any().print(); // or tf.any(x)\n *
\n * \n * \n * const x = tf.tensor2d([1, 1, 0, 0], [2, 2], 'bool');\n * \n * const axis = 1;\n * x.any(axis).print(); //
or tf.any(x, axis)\n * \n * \n * \n * @param x The input tensor. Must be of dtype bool.\n * @param axis The
dimension(s) to reduce. By default it reduces all dimensions.\n * @param keepDims If true, retains reduced
dimensions with size 1.\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction any<T
extends Tensor>(\n x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x =
convertToTensor(x, 'x', 'any', 'bool');\n const inputs: AnyInputs = {x: $x};\n const attrs: AnyAttrs = {axis,
keepDims};\n return ENGINE.runKernel(\n Any, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\n// tslint:disable-next-line:variable-name\nexport const any = op({any_});\n", "/*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0
(the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of
the License at\n * \n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport

```



```
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Returns the indices of the maximum
values along an `axis`.\n *\n * The result has the same shape as `input` with the dimension along `axis`
removed.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.argmax().print(); // or tf.argmax(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 4, 3], [2, 2]);\n * const axis = 1;\n * x.argmax(axis).print(); // or
tf.argmax(x, axis)\n * ```\n *\n * @param x The input tensor.\n * @param axis The dimension to reduce. Defaults to
0 (outer-most dimension).\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n *\nfunction argMax_<T
extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x = convertToTensor(x, 'x', 'argMax');\n\n const
inputs: ArgMaxInputs = {x: $x};\n const attrs: ArgMaxAttrs = {axis};\n\n return ENGINE.runKernel(\n
 ArgMax, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const argMax =
op({argMax_});\n", "/*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {ArgMin, ArgMinAttrs, ArgMinInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Returns the indices of the minimum
values along an `axis`.\n *\n * The result has the same shape as `input` with the dimension along `axis`
removed.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.argMin().print(); // or tf.argMin(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 4, 3], [2, 2]);\n * const axis = 1;\n * x.argMin(axis).print(); // or
tf.argMin(x, axis)\n * ```\n *\n * @param x The input tensor.\n * @param axis The dimension to reduce. Defaults to
0 (outer-most dimension).\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n *\nfunction argMin_<T
extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x = convertToTensor(x, 'x', 'argMin');\n\n const
inputs: ArgMinInputs = {x: $x};\n const attrs: ArgMinAttrs = {axis};\n\n return ENGINE.runKernel(\n
 ArgMin, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const argMin = op({argMin_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Asin, AsinInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
asin of the input `tf.Tensor` element-wise: `asin(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n * x.asin().print(); // or tf.asin(x)\n * ```\n *\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading:
'Basic math'}\n *\nfunction asin_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x',
'asin');\n const inputs: AsinInputs = {x: $x};\n return ENGINE.runKernel(Asin, inputs as {} as
NamedTensorMap);\n}\n\nexport const asin = op({asin_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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=====\n*\n\nimport {ENGINE} from './engine';\nimport {Asinh, AsinhInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes inverse hyperbolic sin of the input `tf.Tensor` element-wise:\n * `asinh(x)`\n *\n * `js`\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.asinh().print(); // or tf.asinh(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction asinh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'asinh');\n\n const inputs: AsinhInputs = {x: $x};\n\n return ENGINE.runKernel(Asinh, inputs as { } as NamedTensorMap);\n}\n\nexport const asinh = op({asinh_});\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\nimport {ENGINE} from './engine';\nimport {Atan, AtanInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes atan of the input `tf.Tensor` element-wise: `atan(x)`\n *\n * `js`\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.atan().print(); // or tf.atan(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction atan_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'atan');\n\n const inputs: AtanInputs = {x: $x};\n\n return ENGINE.runKernel(Atan, inputs as { } as NamedTensorMap);\n}\n\nexport const atan = op({atan_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {ENGINE} from './engine';\nimport {Atan2, Atan2Inputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes arctangent of `tf.Tensor`s a / b element-wise: `atan2(a, b)`\n *\n * Supports broadcasting.\n *\n * `js`\n * const a = tf.tensor1d([1.0, 1.0, -1.0, .7]);\n * const b = tf.tensor1d([2.0, 13.0, 3.5, .21]);\n *\n * tf.atan2(a, b).print()\n *\n * @param a The first tensor.\n * @param b The second tensor.\n * Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction atan2_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'atan2');\n let $b = convertToTensor(b, 'b', 'atan2');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: Atan2Inputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Atan2, inputs as { } as NamedTensorMap);\n}\n\nexport const atan2 = op({atan2_});\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Atanh, AtanhInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes inverse hyperbolic tan of the input `tf.Tensor` element-wise:\n * `atanh(x)`\n * `js` const x = tf.tensor1d([0, .1, -.1, .7]);\n * `x.atanh().print();` // or `tf.atanh(x)`\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction atanh<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'atanh');\n const inputs: AtanhInputs = {x: $x};\n return ENGINE.runKernel(Atanh, inputs as {} as NamedTensorMap);\n}\n\nexport const atanh = op({atanh});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
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\n*\n\nntype PadType = 'SAME'|'VALID'|'NUMBER'|'EXPLICIT';\n\n// For NHWC should be in the following form:\n// [[0, 0], [pad_top,pad_bottom], [pad_left, pad_right], [0, 0]]\n// For NCHW should be in the following form:\n// [[0, 0], [0, 0], [pad_top,pad_bottom], [pad_left, pad_right]]\n// Reference:\n// https://www.tensorflow.org/api_docs/python/tf/nn/conv2d\n\nexport type ExplicitPadding =\n [[number, number], [number, number], [number, number], [number, number]];\n\nexport type PadInfo = {\n top: number,\n left: number,\n right: number,\n bottom: number,\n type: PadType\n};\n\nexport type PadInfo3D = {\n top: number,\n left: number,\n right: number,\n bottom: number,\n front: number,\n back: number,\n type: PadType\n};\n\n/**\n * Information about the forward pass of a convolution/pooling operation.\n * It includes input and output shape, strides, filter size and padding\n * information.\n */\nexport type Conv2DInfo = {\n batchSize: number,\n inHeight: number,\n inWidth: number,\n inChannels: number,\n outHeight: number,\n outWidth: number,\n outChannels: number,\n dataFormat: 'channelsFirst'|'channelsLast',\n strideHeight: number,\n strideWidth: number,\n dilationHeight: number,\n dilationWidth: number,\n filterHeight: number,\n filterWidth: number,\n effectiveFilterHeight: number,\n effectiveFilterWidth: number,\n padInfo: PadInfo,\n inShape: [number, number, number, number],\n outShape: [number, number, number, number],\n filterShape: [number, number, number, number]\n};\n\n/**\n * @param inputShape Input tensor shape is of the following dimensions:\n * `[batch, height, width, inChannels]`\n * @param filterShape The filter shape is of the following dimensions:\n * `[filterHeight, filterWidth, depth]`\n * @param strides The strides of the sliding window for each dimension of the\n * input tensor: `[strideHeight, strideWidth]`\n * If `strides` is a single number,\n * then `strideHeight == strideWidth`\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1*1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution]\n */\n\nexport function computeDilation2DInfo(\n inputShape: [number, number, number, number],\n filterShape: [number, number, number, number],\n strides: number|[number, number],\n pad: 'same'|'valid'|number, dataFormat: 'NHWC' = 'NHWC',\n dilations: number|[number, number]) {\n // `computerConv2DInfo` require filterShape to be in the dimension of:\n // `[filterHeight, filterWidth, depth,
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outDepth]`, dilation2d doesn't have\n // outDepth, it should have the same depth as the input.\n // Input shape:
[batch, height, width, inChannels]\n const inputChannels = inputShape[3];\n const $filterShape =\n [...filterShape, inputChannels] as [number, number, number, number];\n const $dataFormat =\n convertConv2DDataFormat(dataFormat);\n\n return computeConv2DInfo(\n inputShape, $filterShape, strides,\n dilations, pad,\n null /* roundingMode */, null /* depthWise */, $dataFormat);\n}\n\nexport function\ncomputePool2DInfo(\n inShape: [number, number, number, number],\n filterSize: [number, number],\n number,\n strides: number|[number, number],\n dilations: number|[number, number],\n pad: 'same'|'valid'|number,\n roundingMode?: 'floor'|'round'|'ceil',\n dataFormat: 'channelsFirst'|'channelsLast' = 'channelsLast'): Conv2DInfo {\n\n const [filterHeight, filterWidth] = parseTupleParam(filterSize);\n\n let filterShape: [number, number, number,\n number];\n if (dataFormat === 'channelsLast') {\n filterShape = [filterHeight, filterWidth, inShape[3],\n inShape[3]];\n } else if (dataFormat === 'channelsFirst') {\n filterShape = [filterHeight, filterWidth, inShape[1],\n inShape[1]];\n } else {\n throw new Error(`Unknown dataFormat ${dataFormat}`);\n }\n\n return\n computeConv2DInfo(\n inShape, filterShape, strides, dilations, pad, roundingMode, false,\n dataFormat);\n}\n\n/**\n * Computes the information for a forward pass of a pooling3D operation.\n */\nexport\nfunction computePool3DInfo(\n inShape: [number, number, number, number, number],\n filterSize:\n number|[number, number, number],\n strides: number|[number, number, number],\n dilations: number|[number,\n number, number],\n pad: 'same'|'valid'|number,\n roundingMode?: 'floor'|'round'|'ceil',\n dataFormat:\n 'NDHWC'|'NCDHW' = 'NDHWC'): Conv3DInfo {\n const [filterDepth, filterHeight, filterWidth] =\n parse3TupleParam(filterSize);\n\n let filterShape: [number, number, number, number, number];\n let $dataFormat:\n 'channelsFirst'|'channelsLast';\n if (dataFormat === 'NDHWC') {\n $dataFormat = 'channelsLast';\n filterShape\n =\n [filterDepth, filterHeight, filterWidth, inShape[4], inShape[4]];\n } else if (dataFormat === 'NCDHW') {\n $dataFormat = 'channelsFirst';\n filterShape =\n [filterDepth, filterHeight, filterWidth, inShape[1],\n inShape[1]];\n } else {\n throw new Error(`Unknown dataFormat ${dataFormat}`);\n }\n\n return\n computeConv3DInfo(\n inShape, filterShape, strides, dilations, pad, false, $dataFormat,\n roundingMode);\n}\n\n/**\n * Computes the information for a forward pass of a convolution/pooling\n * operation.\n */\nexport function computeConv2DInfo(\n inShape: [number, number, number, number],\n filterShape: [number, number, number, number],\n strides: number|[number, number],\n dilations: number|[number,\n number],\n pad: 'same'|'valid'|number|ExplicitPadding,\n roundingMode?: 'floor'|'round'|'ceil',\n depthwise =\n false,\n dataFormat: 'channelsFirst'|'channelsLast' = 'channelsLast'): Conv2DInfo {\n let [batchSize, inHeight,\n inWidth, inChannels] = [-1, -1, -1, -1];\n if (dataFormat === 'channelsLast') {\n [batchSize, inHeight, inWidth,\n inChannels] = inShape;\n } else if (dataFormat === 'channelsFirst') {\n [batchSize, inChannels, inHeight,\n inWidth] = inShape;\n } else {\n throw new Error(`Unknown dataFormat ${dataFormat}`);\n }\n\n const\n [filterHeight, filterWidth, , filterChannels] = filterShape;\n const [strideHeight, strideWidth] =\n parseTupleParam(strides);\n const [dilationHeight, dilationWidth] = parseTupleParam(dilations);\n\n const\n effectiveFilterHeight =\n getEffectiveFilterSize(filterHeight, dilationHeight);\n const effectiveFilterWidth =\n getEffectiveFilterSize(filterWidth, dilationWidth);\n const {padInfo, outHeight, outWidth} = getPadAndOutInfo(\n pad, inHeight, inWidth, strideHeight, strideWidth, effectiveFilterHeight,\n effectiveFilterWidth,\n roundingMode, dataFormat);\n\n const outChannels = depthwise ? filterChannels * inChannels : filterChannels;\n\n let outShape: [number, number, number, number];\n if (dataFormat === 'channelsFirst') {\n outShape =\n [batchSize, outChannels, outHeight, outWidth];\n } else if (dataFormat === 'channelsLast') {\n outShape =\n [batchSize, outHeight, outWidth, outChannels];\n }\n\n return {\n batchSize,\n dataFormat,\n inHeight,\n inWidth,\n inChannels,\n outHeight,\n outWidth,\n outChannels,\n padInfo,\n strideHeight,\n strideWidth,\n filterHeight,\n filterWidth,\n effectiveFilterHeight,\n effectiveFilterWidth,\n dilationHeight,\n dilationWidth,\n inShape,\n outShape,\n filterShape\n };\n}\n\n/**\n * Information about\n the forward pass of a 3D convolution/pooling operation.\n * It includes input and output shape, strides, filter size\n and padding\n * information.\n */\nexport type Conv3DInfo = {\n batchSize: number,\n inDepth: number,\n inHeight: number,\n inWidth: number,\n inChannels: number,\n outDepth: number,\n outHeight: number,\n outWidth: number,\n outChannels: number,\n dataFormat: 'channelsFirst'|'channelsLast',\n strideDepth: number,\n
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```

strideHeight: number,\n strideWidth: number,\n dilationDepth: number,\n dilationHeight: number,\n
dilationWidth: number,\n filterDepth: number,\n filterHeight: number,\n filterWidth: number,\n
effectiveFilterDepth: number,\n effectiveFilterHeight: number,\n effectiveFilterWidth: number,\n padInfo:
PadInfo3D,\n inShape: [number, number, number, number, number],\n outShape: [number, number, number,
number, number],\n filterShape: [number, number, number, number, number]};\n\n/**\n * Computes the
information for a forward pass of a 3D convolution/pooling\n * operation.\n */\nexport function
computeConv3DInfo(\n inShape: [number, number, number, number, number],\n filterShape: [number, number,
number, number, number],\n strides: number[[number, number, number],\n dilations: number[[number, number,
number],\n pad: 'same'|'valid'|number,\n depthwise = false,\n dataFormat: 'channelsFirst'|'channelsLast' =
'channelsLast',\n roundingMode?: 'floor'|'round'|'ceil'): Conv3DInfo {\n let [batchSize, inDepth, inHeight,
inWidth, inChannels] =\n [-1, -1, -1, -1, -1];\n if (dataFormat === 'channelsLast') {\n [batchSize, inDepth,
inHeight, inWidth, inChannels] = inShape;\n } else if (dataFormat === 'channelsFirst') {\n [batchSize,
inChannels, inDepth, inHeight, inWidth] = inShape;\n } else {\n throw new Error(`Unknown dataFormat
${dataFormat}`);\n }\n\n const [filterDepth, filterHeight, filterWidth, , filterChannels] =\n filterShape;\n const
[strideDepth, strideHeight, strideWidth] = parse3TupleParam(strides);\n const [dilationDepth, dilationHeight,
dilationWidth] =\n parse3TupleParam(dilations);\n\n const effectiveFilterDepth =\n getEffectiveFilterSize(filterDepth, dilationDepth);\n const effectiveFilterHeight =\n getEffectiveFilterSize(filterHeight, dilationHeight);\n const effectiveFilterWidth =\n getEffectiveFilterSize(filterWidth, dilationWidth);\n const {padInfo, outDepth, outHeight, outWidth} =
get3DPadAndOutInfo(\n pad, inDepth, inHeight, inWidth, strideDepth, strideHeight, strideWidth,\n effectiveFilterDepth, effectiveFilterHeight, effectiveFilterWidth,\n roundingMode);\n\n const outChannels =
depthwise ? filterChannels * inChannels : filterChannels;\n\n let outShape: [number, number, number, number,
number];\n if (dataFormat === 'channelsFirst') {\n outShape = [batchSize, outChannels, outDepth, outHeight,
outWidth];\n } else if (dataFormat === 'channelsLast') {\n outShape = [batchSize, outDepth, outHeight,
outWidth, outChannels];\n }\n\n return {\n batchSize,\n dataFormat,\n inDepth,\n inHeight,\n inWidth,\n inChannels,\n outDepth,\n outHeight,\n outWidth,\n outChannels,\n padInfo,\n strideDepth,\n strideHeight,\n strideWidth,\n filterDepth,\n filterHeight,\n filterWidth,\n effectiveFilterDepth,\n effectiveFilterHeight,\n effectiveFilterWidth,\n dilationDepth,\n dilationHeight,\n dilationWidth,\n inShape,\n outShape,\n filterShape\n };\n}\n\nfunction computeOutputShape2D(\n inShape: [number,
number], fieldSize: number, stride: number,\n zeroPad?: number, roundingMode?: 'floor'|'round'|'ceil'): [number,
number] {\n if (zeroPad == null) {\n zeroPad = computeDefaultPad(inShape, fieldSize, stride);\n }\n const
inputRows = inShape[0];\n const inputCols = inShape[1];\n\n const outputRows =\n round((inputRows - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n const outputCols =\n round((inputCols - fieldSize + 2 *
zeroPad) / stride + 1, roundingMode);\n\n return [outputRows, outputCols];\n}\n\nfunction
computeOutputShape4D(\n inShape: [number, number, number, number], fieldSize: number,\n outChannels:
number, stride: number, zeroPad?: number,\n roundingMode?: 'floor'|'round'|'ceil'): [number, number, number,
number] {\n if (zeroPad == null) {\n zeroPad = computeDefaultPad(inShape, fieldSize, stride);\n }\n const
inputDepth = inShape[0];\n const inputRows = inShape[1];\n const inputCols = inShape[2];\n\n const
outputDepths =\n round((inputDepth - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n const outputRows =\n round((inputRows - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n const outputCols =\n round((inputCols - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n\n return [outputDepths, outputRows,
outputCols, outChannels];\n}\n\nexport function computeDefaultPad(\n inputShape: [number, number][[number,
number, number, number],\n fieldSize: number, stride: number, dilation = 1): number {\n const effectiveFieldSize =
getEffectiveFilterSize(fieldSize, dilation);\n return Math.floor(\n (inputShape[0] * (stride - 1) - stride +
effectiveFieldSize) / 2);\n}\n\nfunction parseTupleParam(param: number|number[]): [number, number, number] {\n
if (typeof param === 'number') {\n return [param, param, param];\n }\n if (param.length === 2) {\n return
[param[0], param[1], 1];\n }\n return param as [number, number, number];\n}\n\nfunction
parse3TupleParam(param: number[[number, number, number]]):\n [number, number, number] {\n return typeof

```

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param === 'number' ? [param, param, param] : param;\n}\n\n/* See
https://www.tensorflow.org/api_docs/python/tf/nn/atrous_conv2d\n * Atrous convolution is equivalent to standard
convolution with upsamped\n * filters with effective_filter_height =\n * filter_height + (filter_height - 1) * (dilation
- 1)\n * and effective_filter_width =\n * filter_width + (filter_width - 1) * (dilation - 1),\n * produced by inserting
dilation - 1 zeros along consecutive elements across\n * the filters' spatial dimensions.\n * When there is a dilation,
this converts a filter dimension to the\n * effective filter dimension, so it can be used in a standard convolution.\n
*\nfunction getEffectiveFilterSize(filterSize: number, dilation: number) {\n if (dilation <= 1) {\n return
filterSize;\n }\n return filterSize + (filterSize - 1) * (dilation - 1);\n}\n\nfunction getPadAndOutInfo(\n pad:
'same'|'valid'|number|ExplicitPadding, inHeight: number,\n inWidth: number, strideHeight: number, strideWidth:
number,\n filterHeight: number, filterWidth: number,\n roundingMode: 'floor'|'round'|'ceil',\n dataFormat:
'channelsFirst'|\n 'channelsLast'): {\n padInfo: PadInfo, outHeight: number, outWidth: number } {\n let padInfo:
PadInfo;\n let outHeight: number;\n let outWidth: number;\n if (typeof pad === 'number') {\n const padType =
(pad === 0) ? 'VALID' : 'NUMBER';\n padInfo = {top: pad, bottom: pad, left: pad, right: pad, type: padType};\n
const outShape = computeOutputShape2D(\n [inHeight, inWidth], filterHeight, strideHeight, pad,\n roundingMode);\n
 outHeight = outShape[0];\n outWidth = outShape[1];\n } else if (pad === 'same') {\n outHeight =
Math.ceil(inHeight / strideHeight);\n outWidth = Math.ceil(inWidth / strideWidth);\n const
padAlongHeight =\n Math.max(0, (outHeight - 1) * strideHeight + filterHeight - inHeight);\n const
padAlongWidth =\n Math.max(0, (outWidth - 1) * strideWidth + filterWidth - inWidth);\n const top =
Math.floor(padAlongHeight / 2);\n const bottom = padAlongHeight - top;\n const left =
Math.floor(padAlongWidth / 2);\n const right = padAlongWidth - left;\n padInfo = {top, bottom, left, right, type:
'SAME'};\n } else if (pad === 'valid') {\n padInfo = {top: 0, bottom: 0, left: 0, right: 0, type: 'VALID'};\n
 outHeight = Math.ceil((inHeight - filterHeight + 1) / strideHeight);\n outWidth = Math.ceil((inWidth - filterWidth
+ 1) / strideWidth);\n } else if (typeof pad === 'object') {\n const top = dataFormat === 'channelsLast' ? pad[1][0]
: pad[2][0];\n const bottom = dataFormat === 'channelsLast' ? pad[1][1] : pad[2][1];\n const left = dataFormat
=== 'channelsLast' ? pad[2][0] : pad[3][0];\n const right = dataFormat === 'channelsLast' ? pad[2][1] :
pad[3][1];\n const padType = (top === 0 && bottom === 0 && left === 0 && right === 0) ?\n 'VALID' :\n 'EXPLICIT';\n padInfo = {top, bottom, left, right, type: padType};\n outHeight = round(\n (inHeight -
filterHeight + top + bottom) / strideHeight + 1,\n roundingMode);\n outWidth = round(\n (inWidth -
filterWidth + left + right) / strideWidth + 1, roundingMode);\n } else {\n throw Error('Unknown padding
parameter: ${pad}');\n }\n return {padInfo, outHeight, outWidth};\n}\n\nfunction get3DPadAndOutInfo(\n pad:
'same'|'valid'|number, inDepth: number, inHeight: number,\n inWidth: number, strideDepth: number, strideHeight:
number,\n strideWidth: number, filterDepth: number, filterHeight: number,\n filterWidth: number,\n roundingMode?:
'floor'|'round'|'ceil'): {\n padInfo: PadInfo3D,\n outDepth: number,\n outHeight: number,\n outWidth: number\n}\n
{\n let padInfo: PadInfo3D;\n let outDepth: number;\n let outHeight: number;\n let
outWidth: number;\n\n if (typeof pad === 'number') {\n const padType = (pad === 0) ? 'VALID' : 'NUMBER';\n
 padInfo = {\n top: pad,\n bottom: pad,\n left: pad,\n right: pad,\n front: pad,\n back:
pad,\n type: padType\n };\n const outShape = computeOutputShape4D(\n [inDepth, inHeight, inWidth, 1],
filterDepth, 1, strideDepth, pad,\n roundingMode);\n outDepth = outShape[0];\n outHeight = outShape[1];\n
 outWidth = outShape[2];\n } else if (pad === 'same') {\n outDepth = Math.ceil(inDepth / strideDepth);\n
 outHeight = Math.ceil(inHeight / strideHeight);\n outWidth = Math.ceil(inWidth / strideWidth);\n const
padAlongDepth = (outDepth - 1) * strideDepth + filterDepth - inDepth;\n const padAlongHeight =\n (outHeight -
1) * strideHeight + filterHeight - inHeight;\n const padAlongWidth = (outWidth - 1) * strideWidth +
filterWidth - inWidth;\n const front = Math.floor(padAlongDepth / 2);\n const back = padAlongDepth - front;\n
const top = Math.floor(padAlongHeight / 2);\n const bottom = padAlongHeight - top;\n const left =
Math.floor(padAlongWidth / 2);\n const right = padAlongWidth - left;\n\n padInfo = {top, bottom, left, right,
front, back, type: 'SAME'};\n } else if (pad === 'valid') {\n padInfo = {\n top: 0,\n bottom: 0,\n
 left: 0,\n right: 0,\n front: 0,\n back: 0,\n type: 'VALID'\n };\n outDepth =
Math.ceil((inDepth - filterDepth + 1) / strideDepth);\n outHeight = Math.ceil((inHeight - filterHeight + 1) /
strideHeight);\n outWidth =

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Math.ceil((inWidth - filterWidth + 1) / strideWidth);\n } else {\n throw Error(`Unknown padding parameter:
${pad}`);\n }\n return {padInfo, outDepth, outHeight, outWidth};\n }\n\n/**\n * Rounds a value depending on the
rounding mode\n * @param value\n * @param roundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *
provided, it will default to truncate.\n *^\nfunction round(value: number, roundingMode?: 'floor'|'round'|'ceil') {\n if
(!roundingMode) {\n return Math.trunc(value);\n }\n switch (roundingMode) {\n case 'round':\n // used for
Caffe Conv\n return Math.round(value);\n case 'ceil':\n // used for Caffe Pool\n return Math.ceil(value);\n
 case 'floor':\n return Math.floor(value);\n default:\n throw new Error(`Unknown roundingMode
${roundingMode}`);\n }\n }\n\nexport function tupleValuesAreOne(param: number|number[]): boolean {\n const
[dimA, dimB, dimC] = parseTupleParam(param);\n return dimA === 1 && dimB === 1 && dimC ===
1;\n }\n\nexport function eitherStridesOrDilationsAreOne(\n strides: number|number[], dilations:
number|number[]): boolean {\n return tupleValuesAreOne(strides) || tupleValuesAreOne(dilations);\n }\n\n/**\n *
Convert Conv2D dataFormat from 'NHWC'|'NCHW' to\n * 'channelsLast'|'channelsFirst'\n * @param dataFormat
in 'NHWC'|'NCHW' mode\n * @return dataFormat in 'channelsLast'|'channelsFirst' mode\n * @throws unknown
dataFormat\n *^\nexport function convertConv2DDataFormat(dataFormat: 'NHWC'|'NCHW'):\n
'channelsLast'|'channelsFirst' {\n if (dataFormat === 'NHWC') {\n return 'channelsLast';\n } else if (dataFormat
=== 'NCHW') {\n return 'channelsFirst';\n } else {\n throw new Error(`Unknown dataFormat
${dataFormat}`);\n }\n }\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*/\n\nimport {ENGINE} from './engine';\nimport {Reshape, ReshapeAttrs, ReshapeInputs} from
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {Rank,
ShapeMap, TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Reshapes a `tf.Tensor` to a
given shape.\n * Given an input tensor, returns a new tensor with the same values as the\n * input tensor with
shape `shape`.\n * If one component of shape is the special value -1, the size of that\n * dimension is computed
so that the total size remains constant. In\n * particular, a shape of [-1] flattens into 1-D. At most one component
of\n * shape can be -1.\n * If shape is 1-D or higher, then the operation returns a tensor with shape\n * shape
filled with the values of tensor. In this case, the number of\n * elements implied by shape must be the same as the
number of elements in\n * tensor.\n * ```\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * x.reshape([2, 2]).print();\n * ```\n * @param x The input tensor to be reshaped.\n * @param shape An array of integers defining the output
tensor shape.\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n *^\nfunction reshape<R> extends
Rank>(\n x: Tensor|TensorLike, shape: ShapeMap[R]): Tensor<R> {\n const $x = convertToTensor(x, 'x',
'reshape', 'string_or_numeric');\n const inputs: ReshapeInputs = {x: $x};\n const attrs: ReshapeAttrs = {shape};\n return ENGINE.runKernel(\n Reshape, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n }\n\nexport const reshape = op({reshape_});\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*/\n\nimport {ENGINE} from './engine';\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs} from

```

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./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from
./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
./tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\nimport {cast} from
./cast';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from
./reshape';\n\n/**\n * Computes the 2D average pooling of an image.\n * @param x The input tensor, of rank 4
or rank 3 of shape\n * [batch, height, width, inChannels]. If rank 3, batch of 1 is assumed.\n * @param filterSize
The filter size: [filterHeight, filterWidth]. If\n * filterSize` is a single number, then `filterHeight ==
filterWidth`.\n * @param strides The strides of the pooling: [strideHeight, strideWidth]. If\n * `strides` is a
single number, then `strideHeight == strideWidth`.\n * @param pad The type of padding algorithm:\n * - `same`
and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be
smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n *
[https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from:
'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n *\nfunction avgPool<T extends
Tensor3D|Tensor4D>(\n x: T|TensorLike, filterSize: [number, number]|number,\n strides: [number,
number]|number, pad: 'valid'|'same'|number,\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const $x =
convertToTensor(x, 'x', 'avgPool', 'float32');\n const dilations = 1;\n util.assert(\n
conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n () => `Error in avgPool: Either strides or dilations
must be 1.` +\n `Got strides ${strides} and dilations ${dilations}`);\n let x4D = $x as Tensor4D;\n let
reshapedTo4D = false;\n if ($x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape($x, [1, $x.shape[0],
$x.shape[1], $x.shape[2]]);\n }\n util.assert(\n x4D.rank === 4,\n () => `Error in avgPool: x must be rank 4
but got rank ${x4D.rank}.`);\n if (dimRoundingMode != null) {\n util.assert(\n util.isInt(pad as number),\n
 () => `Error in avgPool: pad must be an integer when using, ` +\n `dimRoundingMode
${dimRoundingMode} but got pad ${pad}.`);\n }\n const inputs: AvgPoolInputs = {x: x4D};\n const attrs:
AvgPoolAttrs = {filterSize, strides, pad, dimRoundingMode};\n // tslint:disable-next-line: no-unnecessary-type-
assertion\n let res = ENGINE.runKernel(\n AvgPool, inputs as {} as NamedTensorMap,\n attrs
as {} as NamedAttrMap) as T;\n res = cast(res, $x.dtype);\n if (reshapedTo4D) {\n return reshape(res,
[res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const avgPool =
op({avgPool_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {ENGINE} from './engine';\nimport {AvgPool3D, AvgPool3DAttrs, AvgPool3DInputs} from
./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor4D, Tensor5D} from
./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
./tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\nimport {cast} from
./cast';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 3D average
pooling.\n * @param x The input tensor, of rank 5 or rank 4 of shape\n * [batch,
depth, height, width, inChannels].\n * @param filterSize The filter size:\n * [filterDepth, filterHeight,
filterWidth].\n * If `filterSize` is a single number,\n * then `filterDepth == filterHeight == filterWidth`.\n *
@param strides The strides of the pooling:\n * [strideDepth, strideHeight, strideWidth].\n * If `strides` is a
single number,\n * then `strideDepth == strideHeight == strideWidth`.\n * @param pad The type of padding
algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n *
-

```



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`valid`: output will be smaller than input if filter is larger
 * than 1*1x1.
 * - For more info, see this guide:
 * [https://www.tensorflow.org/api_guides/python/nn#Convolution](
 * https://www.tensorflow.org/api_guides/python/nn#Convolution)
 * @param dimRoundingMode A string from:
 * 'ceil', 'round', 'floor'. If none is
 * provided, it will default to truncate.
 * @param dataFormat An optional string
 * from: \"NDHWC\", \"NCDHW\". Defaults to
 * \"NDHWC\". Specify the data format of the input and output
 * data. With the
 * default format \"NDHWC\", the data is stored in the order of: [batch,
 * depth, height,
 * width, channels]. Only \"NDHWC\" is currently supported.
 * @doc {heading: 'Operations', subheading:
 * 'Convolution'}
 * ^\nfunction avgPool3d_<T extends Tensor4D|Tensor5D>(
 * x: T|TensorLike, filterSize:
 * [number, number, number]|number,
 * strides: [number, number, number]|number, pad: 'valid'|'same'|number,
 * dimRoundingMode?: 'floor'|'round'|'ceil',
 * dataFormat: 'NDHWC'|'NCDHW' = 'NDHWC'): T {
 * const $x =
 * convertToTensor(x, 'x', 'avgPool3d', 'float32');
 * let x5D = $x as Tensor5D;
 * let reshapedTo5D = false;
 * if
 * ($x.rank === 4) {
 * reshapedTo5D = true;
 * x5D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2],
 * $x.shape[3]]);
 * }
 * util.assert(
 * x5D.rank === 5,
 * () => `Error in avgPool3d: x must be rank 5 but got
 * rank ${x5D.rank}.`);
 * util.assert(
 * dataFormat === 'NDHWC',
 * () => `Error in avgPool3d: Only NDHWC
 * is currently supported, ` +
 * `but got dataFormat of ${dataFormat}`);
 * if (dimRoundingMode != null) {
 * util.assert(
 * util.isInt(pad as number),
 * () => `Error in avgPool3d: pad must be an integer when using, `
 * +
 * `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);
 * }
 * const inputs:
 * AvgPool3DInputs = {x: x5D};
 * const attrs:
 * AvgPool3DAttrs = {filterSize, strides, pad, dimRoundingMode,
 * dataFormat};
 * // tslint:disable-next-line: no-unnecessary-type-assertion
 * let res = ENGINE.runKernel(
 * AvgPool3D, inputs as {} as NamedTensorMap,
 * attrs as {} as NamedAttrMap) as T;
 * res = cast(res,
 * x5D.dtype);
 * if (reshapedTo5D) {
 * return reshape(
 * res, [res.shape[1], res.shape[2], res.shape[3],
 * res.shape[4]] as
 * T;
 * }
 * return res;
 * }
 * \nexport const avgPool3d = op({avgPool3d_});
 * \n
 * @license
 * Copyright 2020 Google LLC. All Rights Reserved.
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 * Unless required by applicable
 * law or agreed to in writing, software
 * distributed under the License is distributed on an \"AS IS\" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for
 * the specific language governing permissions and
 * limitations under the License.
 *
 * =====\n
 * ^\nimport {ENGINE} from './engine';
 * import {Concat, ConcatAttrs, ConcatInputs} from
 * './kernel_names';
 * import {NamedAttrMap} from './kernel_registry';
 * import {Tensor} from './tensor';
 * import
 * {NamedTensorMap} from './tensor_types';
 * import {convertToTensorArray} from './tensor_util_env';
 * import
 * {TensorLike} from './types';
 * import {assert} from './util';
 * \nimport {clone} from './clone';
 * import {op} from
 * './operation';
 * \n
 * Concatenates a list of `tf.Tensor`s along a given axis.
 * The tensors ranks and types
 * must match, and their sizes must match in all
 * dimensions except `axis`.
 * Also available are stricter rank-
 * specific methods that assert that
 * `tensors` are of the given rank:
 * - `tf.concat1d`
 * - `tf.concat2d`
 * -
 * `tf.concat3d`
 * - `tf.concat4d`
 * Except `tf.concat1d` (which does not have axis param), all methods have
 * same signature as this method.
 * ```js
 * const a = tf.tensor1d([1, 2]);
 * const b = tf.tensor1d([3, 4]);
 * a.concat(b).print(); // or a.concat(b)
 * ```
 * ```js
 * const a = tf.tensor1d([1, 2]);
 * const b = tf.tensor1d([3, 4]);
 * const c = tf.tensor1d([5, 6]);
 * tf.concat([a, b, c]).print();
 * ```
 * ```js
 * const a = tf.tensor2d([[1, 2], [10, 20]]);
 * const b = tf.tensor2d([[3, 4], [30, 40]]);
 * const axis = 1;
 * tf.concat([a, b], axis).print();
 * ```
 * @param tensors A list of tensors to concatenate.
 * @param axis The axis to concate along. Defaults to 0
 * (the first dim).
 * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}
 * ^\nfunction concat_<T
 * extends Tensor>(tensors: Array<T|TensorLike>, axis = 0): T {
 * assert(tensors.length >= 1, () => 'Pass at least one
 * tensor to concat');
 * const $tensors =
 * convertToTensorArray(tensors, 'tensors', 'concat',
 * 'string_or_numeric');
 * if ($tensors[0].dtype === 'complex64') {
 * $tensors.forEach(tensor => {
 * if
 * (tensor.dtype !== 'complex64') {
 * throw new Error('Cannot concatenate complex64 tensors with a tensor
 * with dtype ${tensor.dtype}.');
 * }
 * });
 * }
 * if ($tensors.length === 1) {
 * return clone($tensors[0]);
 * }
 * }
 * }

```

```

}\n\n const inputs: ConcatInputs = $ensors;\n const attr: ConcatAttrs = {axis};\n\n return ENGINE.runKernel(\n
Concat, inputs as {} as NamedTensorMap, attr as {} as NamedAttrMap);\n}\n\nexport const concat =
op({concat_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Sigmoid, SigmoidInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
sigmoid element-wise, $1 / (1 + \exp(-x))$ \n *\n * ``js\n * const x = tf.tensor1d([0, -1, 2, -3]);\n *\n *
x.sigmoid().print(); // or tf.sigmoid(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction sigmoid_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'sigmoid');\n\n const inputs: SigmoidInputs = {x: $x};\n\n return
ENGINE.runKernel(Sigmoid, inputs as {} as NamedTensorMap);\n}\n\nexport const sigmoid =
op({sigmoid_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Slice, SliceAttrs, SliceInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {Rank, TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Extracts a slice from a `tf.Tensor` starting at coordinates
`begin`\n *\n * and is of size `size`.\n *\n * Also available are stricter rank-specific methods with the same signature\n *
as this method that assert that `x` is of the given rank:\n * - `tf.slice1d`\n * - `tf.slice2d`\n * - `tf.slice3d`\n * -
`tf.slice4d`\n *\n * ``js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n *\n * x.slice([1], [2]).print();\n *\n * ``\n *\n * ``js\n *
const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * x.slice([1, 0], [1, 2]).print();\n *\n * ``\n *\n * @param x The input
`tf.Tensor` to slice from.\n *\n * @param begin The coordinates to start the slice from. The length can be\n * less
than the rank of x - the rest of the axes will have implicit 0 as\n * start. Can also be a single number, in which case
it specifies the\n * first axis.\n *\n * @param size The size of the slice. The length can be less than the rank of\n * x
- the rest of the axes will have implicit -1. A value of -1 requests\n * the rest of the dimensions in the axis. Can
also be a single number,\n * in which case it specifies the size of the first axis.\n *\n * @doc {heading: 'Tensors',
subheading: 'Slicing and Joining'}\n *\nfunction slice_<R extends Rank, T extends Tensor<R>>(\n x:
T|TensorLike, begin: number|number[], size?: number|number[]): T {\n const $x = convertToTensor(x, 'x', 'slice',
'string_or_numeric');\n\n if ($x.rank === 0) {\n throw new Error('Slicing scalar is not possible');\n }\n\n const
inputs: SliceInputs = {x: $x};\n const attrs: SliceAttrs = {begin, size};\n\n return ENGINE.runKernel(\n Slice,
inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\n\nexport const slice = op({slice_});\n", "/*\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

```

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```
=====
*\n\nimport {ENGINE} from './engine';\nimport {Tanh, TanhInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes hyperbolic tangent of the input `tf.Tensor` element-wise: `tanh(x)`\n * const x = tf.tensor1d([0, 1, -1, 70]);\n * x.tanh().print(); // or tf.tanh(x)\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n * \nfunction tanh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'tanh');\n const inputs: TanhInputs = {x: $x};\n return ENGINE.runKernel(Tanh, inputs as {} as NamedTensorMap);\n}\n\nexport const tanh = op({tanh_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
```

```
*\n\nimport {Scalar, Tensor1D, Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {add} from './add';\nimport {concat} from './concat';\nimport {matMul} from './mat_mul';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {sigmoid} from './sigmoid';\nimport {slice} from './slice';\nimport {tanh} from './tanh';\n\n/**\n * Computes the next state and output of a BasicLSTMCell.\n * Returns `[newC, newH]`.\n * Derived from `tf.contrib.rnn.BasicLSTMCell`.\n * @param forgetBias Forget bias for the cell.\n * @param lstmKernel The weights for the cell.\n * @param lstmBias The bias for the cell.\n * @param data The input to the cell.\n * @param c Previous cell state.\n * @param h Previous cell output.\n * @doc {heading: 'Operations', subheading: 'RNN'}\n * \nfunction basicLSTMCell_(\n forgetBias: Scalar|TensorLike, lstmKernel: Tensor2D|TensorLike,\n lstmBias: Tensor1D|TensorLike, data: Tensor2D|TensorLike,\n c: Tensor2D|TensorLike, h: Tensor2D|TensorLike): [Tensor2D, Tensor2D] {\n const $forgetBias =\n convertToTensor(forgetBias, 'forgetBias', 'basicLSTMCell');\n const $lstmKernel =\n convertToTensor(lstmKernel, 'lstmKernel', 'basicLSTMCell');\n const $lstmBias =\n convertToTensor(lstmBias, 'lstmBias', 'basicLSTMCell');\n const $data =\n convertToTensor(data, 'data', 'basicLSTMCell');\n const $c =\n convertToTensor(c, 'c', 'basicLSTMCell');\n const $h =\n convertToTensor(h, 'h', 'basicLSTMCell');\n const combined = concat([$data, $h], 1);\n const weighted =\n matMul(combined, $lstmKernel);\n const res: Tensor2D = add(weighted, $lstmBias);\n // i = input_gate, j = new_input, f = forget_gate, o = output_gate\n const batchSize = res.shape[0];\n const sliceCols = res.shape[1] / 4;\n const sliceSize: [number, number] = [batchSize, sliceCols];\n const i = slice(res, [0, 0], sliceSize);\n const j = slice(res, [0, sliceCols], sliceSize);\n const f = slice(res, [0, sliceCols * 2], sliceSize);\n const o = slice(res, [0, sliceCols * 3], sliceSize);\n const newC: Tensor2D =\n add(mul(sigmoid(i), tanh(j)), mul($c, sigmoid(add($forgetBias, f)) as Tensor2D));\n const newH: Tensor2D = mul(tanh(newC), sigmoid(o));\n return [newC, newH];\n}\n\nexport const basicLSTMCell = op({basicLSTMCell_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
```

```
*\n\nimport {ENGINE} from './engine';\nimport {BatchToSpaceND, BatchToSpaceNDAttrs,
```

```

BatchToSpaceNDInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_envv';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from
 './operation';\n\n/**\n * This operation reshapes the "batch" dimension 0 into `M + 1` dimensions of\n * shape
`blockShape + [batch]`, interleaves these blocks back into the grid\n * defined by the spatial dimensions `[1, ..., M]`,
to obtain a result with\n * the same rank as the input. The spatial dimensions of this intermediate\n * result are then
optionally cropped according to `crops` to produce the\n * output. This is the reverse of `tf.spaceToBatchND`. See
below for a precise\n * description.\n *
`const x = tf.tensor4d([1, 2, 3, 4], [4, 1, 1, 1]);\n * const
blockShape = [2, 2];\n * const crops = [[0, 0], [0, 0]];\n *
x.batchToSpaceND(blockShape, crops).print();\n *
`@\n * @param x A `tf.Tensor`. N-D with `x.shape` = `[batch] + spatialShape +\n * remainingShape`, where
spatialShape has `M` dimensions.\n * @param blockShape A 1-D array. Must have shape `[M]`, all values must\n *
be ≥ 1 .\n * @param crops A 2-D array. Must have shape `[M, 2]`, all values must be ≥ 0 .\n * `crops[i] =
[cropStart, cropEnd]` specifies the amount to crop from input\n * dimension `i + 1`, which corresponds to spatial
dimension `i`. It is required\n * that `cropStart[i] + cropEnd[i] <= blockShape[i] * inputShape[i + 1]`\n *
This operation is equivalent to the following steps:\n *
1. Reshape `x` to `reshaped` of shape: `[blockShape[0], ..., \n *
blockShape[M-1], batch / prod(blockShape), x.shape[1], ..., \n *
x.shape[N-1]]`\n *
2. Permute dimensions of `reshaped` to produce `permuted` of shape `[batch /\n * prod(blockShape), x.shape[1],
blockShape[0], ..., \n *
x.shape[M], \n * blockShape[M-1], x.shape[M+1], ..., x.shape[N-1]]`\n *
3. Reshape `permuted` to produce `reshapedPermuted` of shape `[batch /\n * prod(blockShape), x.shape[1] *
blockShape[0], ..., x.shape[M] \n *
blockShape[M-1], x.shape[M+1], ..., x.shape[N-1]]`\n *
4. Crop the start and end of dimensions `[1, ..., M]` of `reshapedPermuted`\n * according to `crops` to produce
the output of shape: `[batch /\n *
prod(blockShape), x.shape[1] * blockShape[0] - crops[0,0] - crops[0,1], \n *
..., x.shape[M] * blockShape[M-1] - crops[M-1,0] - \n *
crops[M-1,1], x.shape[M+1], ..., x.shape[N-1]]`\n *
@doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction batchToSpaceND<T extends Tensor>(\n x: T | TensorLike,
blockShape: number[], crops: number[][]): T {\n const $x = convertToTensor(x, 'x', 'batchToSpaceND');\n const prod =
blockShape.reduce((a, b) => a * b);\n util.assert(\n $x.rank >= 1 + blockShape.length, \n () => `input rank is
${$x.rank} but should be > than blockShape.length ${\n blockShape.length}`);\n util.assert(\n crops.length ===
blockShape.length, \n () => `crops.length is ${\n crops.length} but should be equal to
blockShape.length ${\n blockShape.length}`);\n util.assert(\n $x.shape[0] % prod === 0, \n () =>
`input tensor batch is ${\n $x.shape[0]} but is not divisible by the product of ` + \n `the elements of
blockShape ${blockShape.join(' * ')} === ${prod}`);\n const inputs: BatchToSpaceNDInputs = {x: $x};\n const
attrs: BatchToSpaceNDAttrs = {blockShape, crops};\n return ENGINE.runKernel(\n BatchToSpaceND, inputs
as { } as NamedTensorMap, \n attrs as { } as NamedAttrMap);\n}\n\nexport const batchToSpaceND =
op({batchToSpaceND_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
===== \n
*/\nimport {Tensor, Tensor4D} from './tensor';\nimport {Rank} from './types';\nimport {reshape} from
 './reshape';\n\nexport function xAs4D<R extends Rank>(x: Tensor<R>) {\n let x4D: Tensor4D;\n if (x.rank === 0
|| x.rank === 1) {\n x4D = reshape(x, [1, 1, 1, x.size]);\n } else if (x.rank === 2) {\n x4D = reshape(x,
[1, 1, x.shape[0], x.shape[1]]);\n } else if (x.rank === 3) {\n x4D = reshape(x, [1, x.shape[0], x.shape[1],
x.shape[2]]);\n } else {\n x4D = x as Tensor4D;\n }\n return x4D;\n}\n", "/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
=====

```

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```
=====
*\n\nimport {ENGINE} from './engine';\nimport {FusedBatchNorm, FusedBatchNormAttrs,\nFusedBatchNormInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor, Tensor1D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {Rank, TensorLike} from './types';\nimport * as util from './util';\nimport {xAs4D} from './batchnorm_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Batch normalization.\n *\n * As described in\n *\n * http://arxiv.org/abs/1502.03167.\n *\n * Mean, variance, scale, and offset can be\n * of two shapes:\n * - The same shape as the input.\n * - In the common case, the depth dimension is the last\n * dimension of x, so\n * the values would be an `tf.Tensor1D` of shape [depth].\n *\n * Also available are stricter\n * rank-specific methods with the same signature\n * as this method that assert that parameters passed are of given\n * rank\n * - `tf.batchNorm2d`\n * - `tf.batchNorm3d`\n * - `tf.batchNorm4d`\n *\n * @param x The input\n * Tensor.\n * @param mean A mean Tensor.\n * @param variance A variance Tensor.\n * @param offset An offset\n * Tensor.\n * @param scale A scale Tensor.\n * @param varianceEpsilon A small float number to avoid dividing by\n * 0.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n *\n * function batchNorm<R> extends\n * Rank<R>(\n * x: Tensor<R>|TensorLike, mean: Tensor<R>|Tensor1D|TensorLike,\n * variance:\n * Tensor<R>|Tensor1D|TensorLike,\n * offset?: Tensor<R>|Tensor1D|TensorLike,\n * scale?:\n * Tensor<R>|Tensor1D|TensorLike,\n * varianceEpsilon?: number): Tensor<R> {\n * if (varianceEpsilon == null) {\n * varianceEpsilon = 0.001;\n * }\n * const $x = convertToTensor(x, 'x', 'batchNorm');\n * const $mean =\n * convertToTensor(mean, 'mean', 'batchNorm');\n * const $variance = convertToTensor(variance, 'variance',\n * 'batchNorm');\n * let $scale: Tensor<R>|Tensor1D;\n * if (scale != null) {\n * $scale = convertToTensor(scale, 'scale',\n * 'batchNorm');\n * }\n * let $offset: Tensor<R>|Tensor1D;\n * if (offset != null) {\n * $offset = convertToTensor(offset,\n * 'offset', 'batchNorm');\n * }\n * util.assert(\n * $mean.rank === $variance.rank,\n * () => 'Batch normalization\n * gradient requires mean and variance to have '\n * +\n * 'equal ranks.);\n * util.assert(\n * $offset == null ||\n * $mean.rank === $offset.rank,\n * () => 'Batch normalization gradient requires mean and offset to have '\n * +\n * 'equal ranks.);\n * util.assert(\n * $scale == null || $mean.rank === $scale.rank,\n * () => 'Batch normalization\n * gradient requires mean and scale to have '\n * +\n * 'equal ranks.);\n * const x4D: Tensor4D = xAs4D($x);\n * const inputs: FusedBatchNormInputs = {\n * x: x4D,\n * scale: $scale,\n * offset: $offset,\n * mean: $mean,\n * variance: $variance\n * };\n * const attrs: FusedBatchNormAttrs = {varianceEpsilon};\n * // tslint:disable-next-line:\n * no-unnecessary-type-assertion\n * const res = ENGINE.runKernel(\n * FusedBatchNorm, inputs as {\n * NamedTensorMap,\n * attrs as {\n * NamedAttrMap\n * } as Tensor<R>);\n * return reshape(res,\n * $x.shape);\n * }\n * export const batchNorm = op({batchNorm});\n * }\n * /**\n * @license\n * Copyright 2020 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language\n * governing permissions and limitations under the License.\n *

```

```
=====
*\n\nimport {Tensor1D, Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {batchNorm} from './batchnorm';\nimport {op} from './operation';\n\n/**\n * Batch normalization, strictly for 2D. For the more relaxed version, see\n *\n * `tf.batchNorm`.\n *\n * @param x The input Tensor.\n * @param mean A mean Tensor.\n * @param variance A\n * variance Tensor.\n * @param offset An offset Tensor.\n * @param scale A scale Tensor.\n * @param

```

```

varianceEpsilon A small float number to avoid dividing by 0.\n *\nfunction batchNorm2d_(\n x:
Tensor2D|TensorLike, mean: Tensor2D|Tensor1D|TensorLike,\n variance: Tensor2D|Tensor1D|TensorLike,\n offset?: Tensor2D|Tensor1D|TensorLike, scale?: Tensor2D|Tensor1D|TensorLike,\n varianceEpsilon?: number):
Tensor2D {\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean = convertToTensor(mean, 'mean',
'batchNorm');\n const $variance = convertToTensor(variance, 'variance', 'batchNorm');\n let $scale:
Tensor2D|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale', 'batchNorm');\n }\n let
$offset: Tensor2D|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset, 'offset', 'batchNorm');\n
}\n util.assert(\n $x.rank === 2,\n () => `Error in batchNorm2D: x must be rank 2 but got rank ` +\n
`${$x.rank}.`);\n util.assert(\n $mean.rank === 2 || $mean.rank === 1,\n () => `Error in batchNorm2D: mean
must be rank 2 or rank 1 but ` +\n `got rank ${$mean.rank}.`);\n util.assert(\n $variance.rank === 2 ||
$variance.rank === 1,\n () => `Error in batchNorm2D: variance must be rank 2 or rank 1 ` +\n `but got rank
${$variance.rank}.`);\n if ($scale != null) {\n util.assert(\n $scale.rank === 2 || $scale.rank === 1,\n () =>
`Error in batchNorm2D: scale must be rank 2 or rank 1 ` +\n `but got rank ${$scale.rank}.`);\n }\n if ($offset
!= null) {\n util.assert(\n $offset.rank === 2 || $offset.rank === 1,\n () => `Error in batchNorm2D: offset
must be rank 2 or rank 1 ` +\n `but got rank ${$offset.rank}.`);\n }\n return batchNorm($x, $mean,
$variance, $offset, $scale, varianceEpsilon);\n}\n\nexport const batchNorm2d = op({ batchNorm2d_ });\n"/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {Tensor1D, Tensor3D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\nimport {batchNorm} from './batchnorm';\nimport
{op} from './operation';\n\n/**\n * Batch normalization, strictly for 3D. For the more relaxed version, see\n *
`tf.batchNorm`.\n *\n * @param x The input Tensor.\n * @param mean A mean Tensor.\n * @param variance A
variance Tensor.\n * @param offset An offset Tensor.\n * @param scale A scale Tensor.\n * @param
varianceEpsilon A small float number to avoid dividing by 0.\n *\nfunction batchNorm3d_(\n x:
Tensor3D|TensorLike, mean: Tensor3D|Tensor1D|TensorLike,\n variance: Tensor3D|Tensor1D|TensorLike,\n offset?: Tensor3D|Tensor1D|TensorLike, scale?: Tensor3D|Tensor1D|TensorLike,\n varianceEpsilon?: number):
Tensor3D {\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean = convertToTensor(mean, 'mean',
'batchNorm');\n const $variance = convertToTensor(variance, 'variance', 'batchNorm');\n let $scale:
Tensor3D|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale', 'batchNorm');\n }\n let
$offset: Tensor3D|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset, 'offset', 'batchNorm');\n
}\n util.assert(\n $x.rank === 3,\n () => `Error in batchNorm3D: x must be rank 3 but got rank ` +\n
`${$x.rank}.`);\n util.assert(\n $mean.rank === 3 || $mean.rank === 1,\n () => `Error in batchNorm3D: mean
must be rank 3 or rank 1 but ` +\n `got rank ${$mean.rank}.`);\n util.assert(\n $variance.rank === 3 ||
$variance.rank === 1,\n () => `Error in batchNorm3D: variance must be rank 3 or rank 1 ` +\n `but got rank
${$variance.rank}.`);\n if ($scale != null) {\n util.assert(\n $scale.rank === 3 || $scale.rank === 1,\n () =>
`Error in batchNorm3D: scale must be rank 3 or rank 1 ` +\n `but got rank ${$scale.rank}.`);\n }\n if ($offset
!= null) {\n util.assert(\n $offset.rank === 3 || $offset.rank === 1,\n () => `Error in batchNorm3D: offset
must be rank 3 or rank 1 ` +\n `but got rank ${$offset.rank}.`);\n }\n return batchNorm($x, $mean,
$variance, $offset, $scale, varianceEpsilon);\n}\n\nexport const batchNorm3d = op({ batchNorm3d_ });\n"/**\n *
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```

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```
=====
*
* \nimport {Tensor1D, Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\nimport {batchNorm} from './batchnorm';\nimport
{op} from './operation';
\n\n** Batch normalization, strictly for 4D. For the more relaxed version, see
\n *
 * tf.batchNorm.
\n * @param x The input Tensor.
\n * @param mean A mean Tensor.
\n * @param variance A
variance Tensor.
\n * @param offset An offset Tensor.
\n * @param scale A scale Tensor.
\n * @param
varianceEpsilon A small float number to avoid dividing by 0.
\n * \nfunction batchNorm4d_(
 x:
 Tensor4D|TensorLike, mean: Tensor4D|Tensor1D|TensorLike,
 variance: Tensor4D|Tensor1D|TensorLike,
 offset?: Tensor4D|Tensor1D|TensorLike, scale?: Tensor4D|Tensor1D|TensorLike,
 varianceEpsilon?: number):
 Tensor4D
{
 const $x = convertToTensor(x, 'x', 'batchNorm');
 const $mean = convertToTensor(mean, 'mean',
'batchNorm');
 const $variance = convertToTensor(variance, 'variance', 'batchNorm');
 let $scale:
 Tensor4D|Tensor1D;
 if (scale != null) {
 $scale = convertToTensor(scale, 'scale', 'batchNorm');
 }
 let
 $offset: Tensor4D|Tensor1D;
 if (offset != null) {
 $offset = convertToTensor(offset, 'offset', 'batchNorm');
 }
 util.assert(
 $x.rank === 4,
 () => `Error in batchNorm4D: x must be rank 4 but got rank ` +
 `${$x.rank}.`);
 util.assert(
 $mean.rank === 4 || $mean.rank === 1,
 () => `Error in batchNorm4D: mean
must be rank 4 or rank 1 but ` +
 `got rank ${$mean.rank}.`);
 util.assert(
 $variance.rank === 4 ||
 $variance.rank === 1,
 () => `Error in batchNorm4D: variance must be rank 4 or rank 1 ` +
 `but got rank
${$variance.rank}.`);
 if ($scale != null) {
 util.assert(
 $scale.rank === 4 || $scale.rank === 1,
 () =>
 `Error in batchNorm4D: scale must be rank 4 or rank 1 ` +
 `but got rank ${$scale.rank}.`);
 }
 if ($offset
 != null) {
 util.assert(
 $offset.rank === 4 || $offset.rank === 1,
 () => `Error in batchNorm4D: offset
must be rank 4 or rank 1 ` +
 `but got rank ${$offset.rank}.`);
 }
 return batchNorm($x, $mean,
 $variance, $offset, $scale, varianceEpsilon);
}
\n\nexport const batchNorm4d = op({batchNorm4d_});
\n\n**
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2.0 (the "License");
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 * distributed under the License is distributed on an "AS IS" BASIS,
 *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for
the specific language governing permissions and limitations under the License.
=====
\n
```

```
*
* \nimport {ENGINE} from './engine';\nimport {Bincount, BincountAttrs, BincountInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor1D} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';
\n\n** Outputs a
vector with length `size` and the same dtype as `weights`.
\n * If `weights` are empty, then index `i` stores the
number of times the value
 * `i` is counted in `x`. If `weights` are non-empty, then index `i` stores the
 * sum of
the value in `weights` at each index where the corresponding value in
 * `x` is `i`.
\n * Values in `x` outside of
the range [0, size) are ignored.
\n * @param x The input int tensor, rank 1.
\n * @param weights The weights
tensor, must have the same shape as x, or a
 * length-0 Tensor, in which case it acts as all weights equal to 1.
\n * @param size Non-negative integer.
\n * @doc {heading: 'Operations', subheading: 'Reduction'}
\n * \nfunction
bincount_<T extends Tensor1D>(
 x: T|TensorLike, weights: T|TensorLike, size: number): T
{
 const $x =
 convertToTensor(x, 'x', 'bincount');
 const $weights = convertToTensor(weights, 'weights', 'bincount');
 \n util.assert(
 $x.dtype === 'int32',
 () => `Error in bincount: input ` +
 `dtype must be int32, but got
${$x.dtype}.`);
 util.assert(size >= 0, () => `size must be non-negative, but got ${size}.`);
 util.assert(
 $weights.size === $x.size || $weights.size === 0,
 () => `Error in bincount: weights must have the same size as
input or ` +
 `0-length, but got input shape: ${$x.shape}, weights shape: ` +
 `${$weights.shape}.`);
 \n const inputs: BincountInputs = {x: $x, weights: $weights};
 const attrs: BincountAttrs = {size};
 \n return
```

```
ENGINE.runKernel(\n Bincount, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n\n\nexport\nconst bincount = op({bincount_});\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {ENGINE} from '../engine';\nimport {Tile, TileAttrs, TileInputs} from '../kernel_names';\nimport\n{NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from\n './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {Rank, ShapeMap, TensorLike}\n from './types';\nimport {clone} from './clone';\nimport {op} from './operation';\nimport {reshape} from\n './reshape';\n\n/*\n * Broadcast an array to a compatible shape NumPy-style.\n * \n * The tensor's shape is\n * compared to the broadcast shape from end to beginning.\n * \n * Ones are prepended to the tensor's shape until it has the\n * same length as\n * the broadcast shape. If input.shape[i]==shape[i], the (i+1)-th axis is\n * already broadcast-\n * compatible. If input.shape[i]==1 and shape[i]==N, then\n * the input tensor is tiled N times along that axis (using\n * tf.tile).\n * \n * @param input The tensor that is to be broadcasted.\n * @param shape The input is to be broadcast to\n * this shape.\n * \n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n *\nfunction broadcastTo_<R\n extends Rank>(\n x: Tensor|TensorLike, shape: ShapeMap[R]): Tensor<R> {\n let input = convertToTensor(x,\n 'broadcastTo', 'x');\n const xShape = input.shape;\n if (shape.some(d => !(d > 0) || d % 1 !== 0)) {\n throw new\n Error('broadcastTo(): Invalid broadcast shape [{shape}].');\n }\n if (shape.length < input.rank) {\n throw new\n Error('broadcastTo(): shape.length=${shape.length} < input.rank=${\n input.rank}');\n }\n if (shape.length\n > input.rank) {\n const newShape = input.shape.slice();\n while (newShape.length < shape.length) {\n\n newShape.unshift(1);\n }\n input = reshape(input, newShape);\n }\n const inputShape = input.shape;\n const\n reps: number[] = Array.from(shape);\n for (let i = shape.length - 1; i >= 0; i--) {\n if (inputShape[i] === shape[i])\n {\n reps[i] = 1;\n } else if (input.shape[i] !== 1) {\n throw new Error(\n `broadcastTo(): [{xShape}]\n cannot be broadcast to [{shape}].`);\n }\n }\n const axes = reps.map((n, i) => n > 1 ? i : -1).filter(i => i >=\n 0);\n if (axes.length === 0) {\n return clone(input) as Tensor<R>;\n }\n // TODO call broadcastTo kernel\n directly once backends implement broadcastTo\n const inputs: TileInputs = {x: input};\n const attrs: TileAttrs =\n {reps};\n return ENGINE.runKernel(\n Tile, inputs as {} as NamedTensorMap, attrs as unknown as\n NamedAttrMap);\n\n\n\nexport const broadcastTo = op({broadcastTo_});\n\n", "/*\n * @license\n * Copyright 2018\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {ENGINE} from '../engine';\nimport {Ceil, CeilInputs} from '../kernel_names';\nimport {Tensor} from\n './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/*\n * Computes\n * ceiling of input `tf.Tensor` element-wise: `ceil(x)`\n * \n * ``js\n * const x = tf.tensor1d([.6, 1.1, -3.3]);\n * \n * x.ceil().print(); // or tf.ceil(x)\n * \n * @param x The input Tensor.\n * \n * @doc {heading: 'Operations',\n * subheading: 'Basic math'}\n *\nfunction ceil_<T extends Tensor>(x: T|TensorLike): T {\n const $x =\n convertToTensor(x, 'x', 'ceil');\n const inputs: CeilInputs = {x: $x};\n return ENGINE.runKernel(Ceil, inputs as\n {} as NamedTensorMap);\n\n\n\nexport const ceil = op({ceil_});\n\n", "/*\n * @license\n * Copyright 2018 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
```



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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
governing permissions and\n \* limitations under the License.\n \*

```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport\n {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport\n {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Clips\n values element-wise. $\max(\min(x, \text{clipValueMax}), \text{clipValueMin})$ \n *\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n *\n * x.clipByValue(-2, 3).print(); // or tf.clipByValue(x, -2, 3)\n *\n * @param x The input tensor.\n *\n * @param clipValueMin Lower-bound of range to be clipped to.\n *\n * @param clipValueMax Upper-bound of range to be clipped to.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n\nfunction clipByValue<T\n extends Tensor>(\n x: T|TensorLike, clipValueMin: number, clipValueMax: number): T {\n const $x =\n convertToTensor(x, 'x', 'clipByValue');\n util.assert(\n (clipValueMin <= clipValueMax),\n () => `Error in\n clip: min (${clipValueMin}) must be`\n `less than or equal to max (${clipValueMax}).`);\n const inputs:\n ClipByValueInputs = {x: $x};\n const attrs: ClipByValueAttrs = {clipValueMin, clipValueMax};\n return\n ENGINE.runKernel(\n ClipByValue, inputs as {} as NamedTensorMap, attrs as {} as\n NamedAttrMap);\n}\n\nexport const clipByValue = op({clipByValue_});\n\n"/**\n * @license\n * Copyright 2020\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nimport {Tensor1D} from './tensor';\nimport {TensorLike} from './types';\n\nimport {concat} from\n './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of tf.Tensor1D`s along an axis. See\n `concat`\n for details.\n *\n * For example, if:\n * A: shape(3) = |r1, g1, b1|\n * B: shape(2) = |r2, g2|\n * C =\n tf.concat1d([A, B]) == |r1, g1, b1, r2, g2|\n *\n * @param tensors A list of tf.Tensor`s to concatenate.\n *\n * @return\n The concatenated array.\n\nfunction concat1d_(tensors: Array<Tensor1D|TensorLike>): Tensor1D {\n return\n concat(tensors, 0 /* axis */);\n}\n\nexport const concat1d = op({concat1d_});\n\n"/**\n * @license\n * Copyright\n 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nimport {Tensor2D} from './tensor';\nimport {TensorLike} from './types';\n\nimport {concat} from\n './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of tf.Tensor2D`s along an axis. See\n `concat`\n for details.\n *\n * For example, if:\n * A: shape(2, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n * B:\n shape(2, 3) = | r3, g3, b3 |\n * | r4, g4, b4 |\n * C = tf.concat2d([A, B], axis)\n *\n * if axis = 0:\n * C:\n shape(4, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n * | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * if\n axis = 1:\n * C = shape(2, 6) = | r1, g1, b1, r3, g3, b3 |\n * | r2, g2, b2, r4, g4, b4 |\n *\n * @param\n tensors A list of `tf.Tensor`s to concatenate.\n *\n * @param axis The axis to concatenate along.\n *\n * @return The\n concatenated array.\n\nfunction concat2d_(\n tensors: Array<Tensor2D|TensorLike>, axis: number): Tensor2D
```

```
{\n return concat(tensors, axis);\n}\n\nexport const concat2d = op({concat2d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {Tensor3D} from './tensor';\nimport {TensorLike} from './types';\nimport {concat} from\n './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of `tf.Tensor3D`s along an axis.\n * See\n * `concat` for details.\n * \n * For example, if:\n * A: shape(2, 1, 3) = | r1, g1, b1 | | r2, g2, b2 |\n * B: shape(2, 1, 3) = | r3, g3, b3 | | r4, g4, b4 |\n * C = tf.concat3d([A, B], axis)\n * if axis =\n * 0:\n * C: shape(4, 1, 3) = | r1, g1, b1 | | r2, g2, b2 | | r3, g3, b3 | | r4,\n * g4, b4 |\n * if axis = 1:\n * C: shape(2, 2, 3) = | r1, g1, b1, r3, g3, b3 | | r2, g2, b2, r4, g4, b4 |\n * if axis = 2:\n * C = shape(2, 1, 6) = | r1, g1, b1, r3, g3, b3 | | r2, g2, b2, r4, g4, b4 |\n * \n * @param tensors A list of tf.Tensor`s to concatenate.\n * @param axis The axis to concatenate along.\n * @return The\n * concatenated array.\n */\nfunction concat3d_(\n tensors: Array<Tensor3D|TensorLike>, axis: number): Tensor3D\n {\n return concat(tensors, axis);\n}\n\nexport const concat3d = op({concat3d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {Tensor4D} from './tensor';\nimport {TensorLike} from './types';\nimport {concat} from\n './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of `tf.Tensor4D`s along an axis.\n * See\n * `concat` for details.\n * \n * @param tensors A list of `tf.Tensor`s to concatenate.\n * @param axis The axis to\n * concatenate along.\n * @return The concatenated array.\n */\nfunction concat4d_(\n tensors:\n Array<Tensor4D|TensorLike>, axis: number): Tensor4D\n {\n return concat(tensors, axis);\n}\n\nexport const\n concat4d = op({concat4d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {ENGINE} from './engine';\nimport {Conv2D, Conv2DAttrs, Conv2DInputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from\n './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport * as conv_util\n from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes a 2D\n * convolution over the input x.\n * \n * @param x The input tensor, of rank 4 or rank 3, of shape\n * `[batch, height,\n * width, inChannels]`. If rank 3, batch of 1 is\n * assumed.\n * @param filter The filter, rank 4, of shape\n * `[filterHeight, filterWidth, inDepth, outDepth]`.\n * @param strides The strides of the convolution: `[strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same\n * size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger
```

than 1x1.\n \* - For more info, see this guide:\n \*  
[\[https://www.tensorflow.org/api\\_guides/python/nn#Convolution\]](https://www.tensorflow.org/api_guides/python/nn#Convolution)(\n \*  
[https://www.tensorflow.org/api\\_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution))\n \* @param dataFormat: An optional string from:  
 \"NHWC\", \"NCHW\". Defaults to\n \* \"NHWC\". Specify the data format of the input and output data. With  
 the\n \* default format \"NHWC\", the data is stored in the order of: [batch,\n \* height, width, channels].\n \*  
 @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n \* in which we sample input values across  
 the height and width dimensions\n \* in atrous convolution. Defaults to `[1, 1]`. If `dilations` is a single\n \*  
 number, then `dilationHeight == dilationWidth`. If it is greater than\n \* 1, then all values of `strides` must be 1.\n \*  
 @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n \* provided, it will default to  
 truncate.\n \*  
 @doc {heading: 'Operations', subheading: 'Convolution'}\n \*/\nfunction conv2d<T extends  
 Tensor3D|Tensor4D>(\n x: T|TensorLike, filter: Tensor4D|TensorLike,\n strides: [number, number]|number,\n pad: 'valid'|'same'|number|conv\_util.ExplicitPadding,\n dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n dilations:  
 [number, number]|number = [1, 1],\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const \$x =  
 convertToTensor(x, 'x', 'conv2d');\n const \$filter = convertToTensor(filter, 'filter', 'conv2d');\n let x4D = \$x as  
 Tensor4D;\n let reshapedTo4D = false;\n if (\$x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape(\$x,  
 [1, \$x.shape[0], \$x.shape[1], \$x.shape[2]]);\n }\n util.assert(\n x4D.rank === 4,\n () => `Error in conv2d:  
 input must be rank 4, but got rank \${x4D.rank}.`);\n util.assert(\n \$filter.rank === 4,\n () => `Error in  
 conv2d: filter must be rank 4, but got rank ` +\n ` \${\$filter.rank}.`);\n if (dimRoundingMode != null) {\n  
 util.assert(\n util.isInt(pad as number),\n () => `Error in conv2d: pad must be an integer when using, ` +\n ` +\n ` dimRoundingMode \${dimRoundingMode} but got pad \${pad}.`);\n }\n const inDepth = dataFormat ===  
 'NHWC' ? x4D.shape[3] : x4D.shape[1];\n util.assert(\n inDepth === \$filter.shape[2],\n () => `Error in  
 conv2d: depth of input (\${inDepth}) must match ` +\n ` +\n ` input depth for filter (\${filter.shape[2]}).`);\n  
 util.assert(\n conv\_util.eitherStridesOrDilationsAreOne(strides, dilations),\n () => `Error in conv2D: Either  
 strides or dilations must be 1.` +\n ` +\n ` Got strides \${strides} and dilations '\${dilations}'`);\n const inputs:  
 Conv2DInputs = {x: x4D, filter: \$filter};\n const attrs:\n Conv2DAttrs = {strides, pad, dataFormat, dilations,  
 dimRoundingMode};\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res =  
 ENGINE.runKernel(\n Conv2D, inputs as { } as NamedTensorMap,\n attrs as { } as  
 NamedAttrMap) as T;\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as  
 T;\n }\n return res;\n }\n\nexport const conv2d = op({conv2d\_});\n"/\*\*\n \* @license\n \* Copyright 2020 Google  
 LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not  
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 software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
 governing permissions and\n \* limitations under the License.\n \*  
 =====\n\n \*/\nimport {Tensor2D, Tensor3D, Tensor4D} from './tensor';\nimport {convertToTensor} from  
 './tensor\_util\_env';\nimport {TensorLike} from './types';\nimport \* as util from './util';\nimport {conv2d} from  
 './conv2d';\nimport \* as conv\_util from './conv\_util';\nimport {op} from './operation';\nimport {reshape} from  
 './reshape';\n\n/\*\*\n \* Computes a 1D convolution over the input x.\n \*  
 @param x The input tensor, of rank 3 or  
 rank 2, of shape\n \* `[batch, width, inChannels]`. If rank 2, batch of 1 is assumed.\n \*  
 @param filter The filter,  
 rank 3, of shape\n \* `[filterWidth, inDepth, outDepth]`.\n \*  
 @param stride The number of entries by which the  
 filter is moved right at\n \* each step.\n \*  
 @param pad The type of padding algorithm.\n \* - `same` and stride 1:  
 output will be of same size as input,\n \* regardless of filter size.\n \* - `valid`: output will be smaller than input  
 if filter is larger\n \* than 1x1.\n \* - For more info, see this guide:\n \*  
[\[https://www.tensorflow.org/api\\_guides/python/nn#Convolution\]](https://www.tensorflow.org/api_guides/python/nn#Convolution)(\n \*  
[https://www.tensorflow.org/api\\_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution))\n \* @param dataFormat An optional string from  
 \"NWC\", \"NCW\". Defaults to \"NWC\",  
 the data is stored in the order of [batch, in\_width, in\_channels].

Only `"NWC"` is currently supported.

`@param dilation` The dilation rate in which we sample input values in atrous convolution. Defaults to `1`. If it is greater than 1, then `stride` must be `1`.

`@param dimRoundingMode` A string from: `'ceil'`, `'round'`, `'floor'`. If none is provided, it will default to `truncate`.

`@doc {heading: 'Operations', subheading: 'Convolution'}`

```

function conv1d<T extends
Tensor2D|Tensor3D>(x: T|TensorLike, filter: Tensor3D|TensorLike, stride: number, pad:
'valid'|'same'|number|conv_util.ExplicitPadding, dataFormat: 'NWC'|'NCW' = 'NWC', dilation = 1,
dimRoundingMode?: 'floor'|'round'|'ceil'): T {
 const $x = convertToTensor(x, 'x', 'conv1d');
 const $filter =
convertToTensor(filter, 'filter', 'conv1d');
 let x3D = $x as Tensor3D;
 let reshapedTo3D = false;
 if ($x.rank
=== 2) {
 reshapedTo3D = true;
 x3D = reshape($x, [1, $x.shape[0], $x.shape[1]]);
 }
 util.assert(x3D.rank === 3, () => `Error in conv1d: input must be rank 3, but got rank ${x3D.rank}.`);
 util.assert($filter.rank === 3, () => `Error in conv1d: filter must be rank 3, but got rank ` +
`${$filter.rank}.`);
 if (dimRoundingMode != null) {
 util.assert(util.isInt(pad as number), () => `Error in conv1d: pad
must be an integer when using, ` +
`${dimRoundingMode} ${dimRoundingMode} but got pad ${pad}.`);
 }
 util.assert(x3D.shape[2] === $filter.shape[1], () => `Error in conv1d: depth of input
(${x3D.shape[2]}) must match ` +
`${input depth for filter ${$filter.shape[1]}.`);
 util.assert(conv_util.eitherStridesOrDilationsAreOne(stride, dilation), () => `Error in conv1D: Either stride or dilation
must be 1. ` +
`${Got stride ${stride} and dilation '${dilation}'`);
 util.assert(dataFormat === 'NWC', () => `Error in conv1d: got dataFormat of ${
dataFormat} but only NWC is currently supported.`);
 const filter4D = reshape($filter, [1, $filter.shape[0], $filter.shape[1], $filter.shape[2]]);
 const input4D = reshape(x3D, [x3D.shape[0], 1, x3D.shape[1], x3D.shape[2]]);
 const strides: [number, number] = [1, stride];
 const dilations: [number, number] = [1, dilation];
 const conv2dDataFormat = 'NHWC';
 const res =
conv2d(input4D as Tensor4D, (filter4D as Tensor4D), strides, pad, conv2dDataFormat, dilations,
dimRoundingMode);
 if (reshapedTo3D) {
 return reshape(res, [res.shape[2], res.shape[3]]) as T;
 }
 return reshape(res, [res.shape[0], res.shape[2], res.shape[3]]) as T;
}
export const conv1d =
op({conv1d_});
"/**
 * @license
 * Copyright 2020 Google LLC. All Rights Reserved.
 * Licensed under the
Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the
License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed
on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.
 * See the License for the specific language governing permissions and
 * limitations under the
License.
 */
=====
import {ENGINE} from '../engine';
import {Conv2DBackpropInput, Conv2DBackpropInputAttrs,
Conv2DBackpropInputInputs} from '../kernel_names';
import {NamedAttrMap} from '../kernel_registry';
import {Tensor3D, Tensor4D} from '../tensor';
import {NamedTensorMap} from '../tensor_types';
import * as util from
'./util';
import * as conv_util from './conv_util';
import {op} from './operation';
import {reshape} from
'./reshape';
/**
 * Computes the derivative of the input of a 2D convolution.
 *
 * @param xShape The shape
of the input: [batch, height, width, inDepth].
 * If length of 3, batch of 1 is assumed.
 * @param dy The derivative
of the output, of rank 4 or rank 3 of shape
 * `[batch, outHeight, outWidth, outDepth]`.
If rank 3, batch of 1 is
assumed.
 * @param filter The filter, rank 4, of shape
 * `[filterHeight, filterWidth, inDepth, outDepth]`.
 * @param strides The strides of the convolution:
 * `[strideHeight,
 * strideWidth]`.
 * @param pad The type of
padding algorithm used:
 * - `same` and stride 1: output will be of same size as input,
 * regardless of filter
size.
 * - `valid`: output will be smaller than input if filter is larger
 * than 1x1.
 * @param dataFormat: An
optional string from: "NHWC", "NCHW".
Defaults to "NHWC". Specify the data format of the input and
output data. With the
 * default format "NHWC", the data is stored in the order of:
[batch,
 * height, width,
channels].
 * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'.
If none is
 * provided, it will
default to truncate.
 */
function conv2DBackpropInput<T extends Tensor3D|Tensor4D>(xShape: [number,
number, number, number])[number, number, number], dy: T, filter: Tensor4D, strides: [number,

```

```

number]]number,\n pad: 'valid'|'same'|number|conv_util.ExplicitPadding,\n dataFormat: 'NHWC'|'NCHW' =
'NHWC',\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n util.assert(\n xShape.length === dy.rank,\n ()
=> `Length of inShape ` +\n `(${xShape.length}) and rank of dy (${dy.rank}) must match`);\n\n let xShape4D
= xShape as [number, number, number, number];\n let dy4D = dy as Tensor4D;\n let reshapedTo4D = false;\n if
(dy.rank === 3) {\n reshapedTo4D = true;\n dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n
xShape4D = [1, xShape[0], xShape[1], xShape[2]];\n }\n util.assert(\n xShape4D.length === 4,\n () =>\n
`Error in conv2dDerInput: inShape must be length 4, but got length ` +\n `${xShape4D.length}`);\n
util.assert(\n dy4D.rank === 4,\n () => `Error in conv2dDerInput: dy must be rank 4, but got ` +\n `rank
${dy4D.rank}`);\n util.assert(\n filter.rank === 4,\n () => `Error in conv2dDerInput: filter must be rank 4, but
got ` +\n `rank ${filter.rank}`);\n const inDepth = dataFormat === 'NHWC' ? xShape4D[3] : xShape4D[1];\n
const outDepth = dataFormat === 'NHWC' ? dy4D.shape[3] : dy4D.shape[1];\n util.assert(\n inDepth ===
filter.shape[2],\n () => `Error in conv2dDerInput: depth of input (${inDepth}) must ` +\n `match input
depth for filter ${filter.shape[2]}`);\n util.assert(\n outDepth === filter.shape[3],\n () => `Error in
conv2dDerInput: depth of output (${outDepth}) must ` +\n `match output depth for filter
${filter.shape[3]}`);\n if (dimRoundingMode != null) {\n util.assert(\n util.isInt(pad as number),\n () =>
`Error in conv2dDerInput: pad must be an integer when using, ` +\n `dimRoundingMode
${dimRoundingMode} but got pad ${pad}`);\n }\n\n const inputs: Conv2DBackpropInputInputs = {dy: dy4D,
filter};\n\n const attrs: Conv2DBackpropInputAttrs = {\n strides, pad, dataFormat, dimRoundingMode,\n inputShape: xShape4D};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res =
ENGINE.runKernel(\n Conv2DBackpropInput, inputs as {} as NamedTensorMap,\n attrs as {}
as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]])
as T;\n }\n return res;\n}\n\nexport const conv2DBackpropInput = op({conv2DBackpropInput_});\n\n"/**\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====*\n
*/\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport {conv2DBackpropInput} from './conv2d_backprop_input';\nimport {op}
from './operation';\n\n/**\n * Computes the transposed 2D convolution of an image, also known as a\n *
deconvolution.\n * @param x The input image, of rank 4 or rank 3, of shape\n * `[batch, height, width,
inDepth]`. If rank 3, batch of 1 is assumed.\n * @param filter The filter, rank 4, of shape\n * `[filterHeight,
filterWidth, outDepth, inDepth]`. \n * `inDepth` must match `inDepth` in `x`.\n * @param outputShape Output
shape, of rank 4 or rank 3:\n * `[batch, height, width, outDepth]`. If rank 3, batch of 1 is assumed.\n * @param
strides The strides of the original convolution:\n * `[strideHeight, strideWidth]`.\n * @param pad The type of
padding algorithm used in the non-transpose version\n * of the op.\n * @param dimRoundingMode A string from:
'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n * @doc {heading: 'Operations',
subheading: 'Convolution'}\n */\nfunction conv2dTranspose_<T extends Tensor3D|Tensor4D>(\n x:\n T|TensorLike, filter: Tensor4D|TensorLike,\n outputShape: [number, number, number, number]|[number, number,
number],\n strides: [number, number]number, pad: 'valid'|'same'|number,\n dimRoundingMode?:
'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'conv2dTranspose');\n const $filter =
convertToTensor(filter, 'filter', 'conv2dTranspose');\n\n return conv2DBackpropInput(\n outputShape, $x, $filter,
strides, pad, 'NHWC', dimRoundingMode);\n}\n\nexport const conv2dTranspose =
op({conv2dTranspose_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *

```

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====
*/\nimport {ENGINE} from './engine';\nimport {Conv3D, Conv3DAttrs, Conv3DInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor4D, Tensor5D} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport
 {eitherStridesOrDilationsAreOne} from './conv_util';\nimport {op} from './operation';\nimport {reshape} from
 './reshape';\n\n/**\n * Computes a 3D convolution over the input x.\n * @param x The input tensor, of rank 5 or
 rank 4, of shape\n * `[batch, depth, height, width, channels]`. If rank 4,\n * batch of 1 is assumed.\n * @param filter The filter, rank 5, of shape\n * `[filterDepth, filterHeight, filterWidth, inChannels, outChannels]`.\n *
 inChannels must match between input and filter.\n * @param strides The strides of the convolution: `[strideDepth,
 strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output
 will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter
 is larger\n * than 1x1.\n * - For more info, see this guide:\n *
 [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
 https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat: An optional string from:
 \"NDHWC\", \"NCDHW\". Defaults to\n * \"NDHWC\". Specify the data format of the input and output data.
 With the\n * default format \"NDHWC\", the data is stored in the order of: [batch,\n * depth, height, width,
 channels]. Only \"NDHWC\" is currently supported.\n * @param dilations The dilation rates: `[dilationDepth,
 dilationHeight,\n * dilationWidth]` in which we sample input values across the height\n * and width
 dimensions in atrous convolution. Defaults to `[1, 1, 1]`.\n * If `dilations` is a single number, then\n *
 `dilationDepth == dilationHeight == dilationWidth`. If it is greater\n * than 1, then all values of `strides` must be
 1.\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction conv3d<T extends
 Tensor4D|Tensor5D>(\n x: T|TensorLike, filter: Tensor5D|TensorLike,\n strides: [number, number,
 number][number, pad: 'valid'|'same',\n dataFormat: 'NDHWC'|'NCDHW' = 'NDHWC',\n dilations: [number,
 number, number][number = [1, 1, 1]): T {\n const $x = convertToTensor(x, 'x', 'conv3d');\n const $filter =
 convertToTensor(filter, 'filter', 'conv3d');\n let x5D = $x as Tensor5D;\n let reshapedTo5D = false;\n if
 ($x.rank === 4) {\n reshapedTo5D = true;\n x5D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2],
 $x.shape[3]]);\n }\n util.assert(\n x5D.rank === 5,\n () => `Error in conv3d: input must be rank 5, but got
 rank ${x5D.rank}.`);\n util.assert(\n $filter.rank === 5,\n () => `Error in conv3d: filter must be rank 5, but got
 rank ` +\n `${$filter.rank}.`);\n util.assert(\n x5D.shape[4] === $filter.shape[3],\n () => `Error in
 conv3d: depth of input (${x5D.shape[4]}) must match ` +\n `input depth for filter ${$filter.shape[3]}.`);\n util.assert(\n eitherStridesOrDilationsAreOne(strides, dilations),\n () => 'Error in conv3D: Either strides or
 dilations must be 1.' +\n `Got strides ${strides} and dilations '${dilations}'`);\n util.assert(\n dataFormat
 === 'NDHWC',\n () => `Error in conv3d: got dataFormat of ${\n dataFormat} but only NDHWC is
 currently supported.`);\n const inputs: Conv3DInputs = {x: x5D, filter: $filter};\n const attrs: Conv3DAttrs =
 {strides, pad, dataFormat, dilations};\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res =
 ENGINE.runKernel(\n Conv3D, inputs as {} as NamedTensorMap,\n attrs as {} as
 NamedAttrMap) as T;\n if (reshapedTo5D) {\n return reshape(\n res, [res.shape[1], res.shape[2],
 res.shape[3], res.shape[4]]) as\n T;\n }\n return res;\n }\n\nexport const conv3d = op({conv3d});\n\n"/**\n *
 @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
 copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
 law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
```

the specific language governing permissions and limitations under the License.

```
=====
* \nimport {ENGINE} from './engine';\nimport {Conv3DBackpropInputV2, Conv3DBackpropInputV2Attrs,
Conv3DBackpropInputV2Inputs} from './kernel_names';\nimport {NamedAttrMap} from
 './kernel_registry';\nimport {Tensor4D, Tensor5D} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport * as util from './util';\nimport {op} from './operation';\nimport {reshape} from
 './reshape';\n\n/**\n * Computes the derivative of the input of a 3D convolution.\n * @param xShape The shape
of the input: [batch, depth, height, width, in_channels]. If length of 4, batch of 1 is assumed.\n * @param dy The
derivative of the output, of rank 5 or rank 4 of shape [batch, outDepth, outHeight, outWidth, in_channels].\n *
If rank 4, batch of 1 is assumed.\n * @param filter The filter, rank 5, of shape [filterDepth, filterHeight,
filterWidth, inDepth, outDepth].\n * @param strides The strides of the convolution: [strideDepth, strideHeight,
strideWidth].\n * @param pad The type of padding algorithm used: 'same' and stride 1: output will be of
same size as input, 'valid': output will be smaller than input if filter is
larger than 1x1.\n */\nfunction conv3DBackpropInput_<T extends Tensor4D|Tensor5D>(\n xShape:\n [number, number, number, number, number],\n dy: T, filter: Tensor5D,\n strides: [number, number, number, number, number],\n pad: 'valid'|'same'): T {\n util.assert(\n xShape.length ===
dy.rank,\n () => `Length of inShape ` +\n `(${xShape.length}) and rank of dy (${dy.rank}) must
match`);\n let xShape5D = xShape as [number, number, number, number, number];\n let dy5D = dy as
Tensor5D;\n let reshapedTo5D = false;\n if (dy.rank === 4) {\n reshapedTo5D = true;\n dy5D = reshape(dy, [1,
dy.shape[0], dy.shape[1], dy.shape[2], dy.shape[3]]);\n xShape5D = [1, xShape[0], xShape[1], xShape[2],
xShape[3]];\n }\n const inDepth = xShape5D[4];\n const outDepth = dy5D.shape[4];\n util.assert(\n
xShape5D.length === 5,\n () => `Error in conv3dDerInput: inShape must be length 5, but got length ` +\n
`${xShape5D.length}`);\n util.assert(\n dy5D.rank === 5,\n () => `Error in conv3dDerInput: dy must be
rank 5, but got ` +\n `rank ${dy5D.rank}`);\n util.assert(\n filter.rank === 5,\n () => `Error in
conv3dDerInput: filter must be rank 5, but got ` +\n `rank ${filter.rank}`);\n util.assert(\n inDepth ===
filter.shape[3],\n () => `Error in conv3dDerInput: depth of input (${inDepth}) must ` +\n `match input
depth for filter ${filter.shape[3]}`);\n util.assert(\n outDepth === filter.shape[4],\n () => `Error in
conv3dDerInput: depth of output (${outDepth}) must ` +\n `match output depth for filter
${filter.shape[4]}`);\n const inputs: Conv3DBackpropInputV2Inputs = {dy: dy5D, filter};\n const attrs:\n Conv3DBackpropInputV2Attrs = {pad, strides, inputShape: xShape5D};\n // tslint:disable-next-line: no-
unnecessary-type-assertion\n const res = ENGINE.runKernel(\n Conv3DBackpropInputV2, inputs as {\n
as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n if (reshapedTo5D) {\n return
reshape(\n res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]]) as\n T;\n }\n return
res;\n}\n\nexport const conv3DBackpropInput = op({conv3DBackpropInput_});\n\n/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
=====
```

```
* \nimport {Tensor4D, Tensor5D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport {conv3DBackpropInput} from './conv3d_backprop_input';\nimport {op}
from './operation';\n\n/**\n * Computes the transposed 3D convolution of a volume, also known as a\n *
deconvolution.\n * @param x The input image, of rank 5 or rank 4, of shape [batch, depth, height, width,
inDepth]. If rank 4, batch of 1 is assumed.\n * @param filter The filter, rank 4, of shape [depth, filterHeight,
filterWidth, outDepth, inDepth].\n * `inDepth` must match `inDepth` in `x`.\n * @param outputShape Output
shape, of rank 5 or rank 4: [batch, depth, height, width, outDepth]. If rank 3, batch of 1 is\n * assumed.\n */
```





```

{TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes the cumulative sum of a
`tf.Tensor` along `axis`.\n * ``js\n * const x = tf.tensor([1, 2, 3, 4]);\n * x.cumsum().print();\n * ``\n * ``js\n * const x = tf.tensor([[1, 2], [3, 4]]);\n * x.cumsum().print();\n * ``\n * @param x The input tensor to be
summed.\n * @param axis The axis along which to sum. Optional. Defaults to 0.\n * @param exclusive Whether to
perform exclusive cumulative sum. Optional.\n * Defaults to false. If set to true then the sum of each tensor
entry\n * does not include its own value, but only the values previous to it\n * along the specified axis.\n *
@param reverse Whether to sum in the opposite direction. Optional.\n * Defaults to false.\n * @doc
{heading: 'Operations', subheading: 'Scan'}\n\nfunction cumsum_<T extends Tensor>(\n x: Tensor|TensorLike,\n axis = 0, exclusive = false, reverse = false): T {\n const $x = convertToTensor(x, 'x', 'cumsum');\n\n const inputs:\n CumsumInputs = {x: $x};\n const attrs: CumsumAttrs = {axis, exclusive, reverse};\n\n return\n ENGINE.runKernel(\n Cumsum, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n\n}\n\nexport\nconst cumsum = op({cumsum_});\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n\n\nimport {ENGINE} from './engine';\nimport {DenseBincount, DenseBincountAttrs, DenseBincountInputs}\nfrom './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor1D, Tensor2D} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {op} from
 './operation';\n\n/**\n * Outputs a vector with length `size` and the same dtype as `weights`.\n * If `weights` are empty, then index `i` stores the number of times the value\n * `i` is counted in `x`. If `weights` are non-empty, then
index `i` stores the\n * sum of the value in `weights` at each index where the corresponding value in\n * `x` is `i`.\n * Values in `x` outside of the range [0, size) are ignored.\n * @param x The input int tensor, rank 1 or rank
2.\n * @param weights The weights tensor, must have the same shape as x, or a\n * length-0 Tensor, in which
case it acts as all weights equal to 1.\n * @param size Non-negative integer.\n * @param binaryOutput Optional.
Whether the kernel should count the appearance\n * or number of occurrences. Defaults to False.\n * @doc
{heading: 'Operations', subheading: 'Reduction'}\n\nfunction denseBincount_<T extends Tensor1D|Tensor2D>(\n x: T|TensorLike, weights: T|TensorLike, size: number,\n binaryOutput = false): T {\n const $x =\n convertToTensor(x, 'x', 'denseBincount');\n const $weights = convertToTensor(weights, 'weights',\n 'denseBincount');\n\n util.assert(\n $x.dtype === 'int32',\n () => `Error in denseBincount: input ` +\n `dtype must be int32, but got ${$x.dtype}`);\n util.assert(\n $x.rank <= 2,\n () => `Error in denseBincount:\n input must be at most rank 2, but got ` +\n `rank ${$x.rank}.`);\n util.assert(size >= 0, () => `size must be non-\n negative, but got ${size}.`);\n util.assert(\n $weights.size === $x.size || $weights.size === 0,\n () =>\n `Error in denseBincount: weights must have the same shape as x or ` +\n `0-length, but got x shape:\n ${$x.shape}, weights shape: ` +\n `${$weights.shape}.`);\n\n const inputs: DenseBincountInputs = {x: $x,\n weights: $weights};\n const attrs: DenseBincountAttrs = {size, binaryOutput};\n\n return ENGINE.runKernel(\n DenseBincount, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n\n}\n\nexport const\n denseBincount = op({denseBincount_});\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*/\n\nimport {ENGINE} from './engine';\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor4D} from './tensor';\nimport
 {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike4D} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n *
 Rearranges data from depth into blocks of spatial data. More specifically,\n * this op outputs a copy of the input
 tensor where values from the `depth`\n * dimension are moved in spatial blocks to the `height` and `width`
 dimensions.\n * The attr `blockSize` indicates the input block size and how the data is\n * moved.\n * - Chunks
 of data of size `blockSize * blockSize` from depth are rearranged\n * into non-overlapping blocks of size `blockSize
 x blockSize`\n * - The width the output tensor is `inputWidth * blockSize`, whereas the\n * height is
 `inputHeight * blockSize`\n * - The Y, X coordinates within each block of the output image are determined\n *
 by the high order component of the input channel index\n * - The depth of the input tensor must be divisible by
 `blockSize * blockSize`\n * - The `dataFormat` attr specifies the layout of the input and output tensors\n *
 with the following options: `NHWC`: [`batch, height, width, channels`]\n * `NCHW`: [`batch, channels,
 height, width`]\n * ``js\n * const x = tf.tensor4d([1, 2, 3, 4], [1, 1, 1, 4]);\n * const blockSize = 2;\n * const
 dataFormat = `NHWC`;\n * tf.depthToSpace(x, blockSize, dataFormat).print();\n * ``\n * @param x The
 input tensor of rank 4\n * @param blockSize An `int` that is `>= 2`. The size of the spatial block\n * @param
 dataFormat An optional string from: `NHWC`, `NCHW`. Defaults to `NHWC`\n * @doc {heading:
 'Tensors', subheading: 'Transformations'}\n */\nfunction depthToSpace_(\n x: Tensor4D|TensorLike4D,
 blockSize: number,\n dataFormat: `NHWC`|`NCHW` = `NHWC`): Tensor4D {\n const $x = convertToTensor(x, 'x',
 'depthToSpace') as Tensor4D;\n const inputHeight = (dataFormat === `NHWC`) ? $x.shape[1] : $x.shape[2];\n
 const inputWidth = (dataFormat === `NHWC`) ? $x.shape[2] : $x.shape[3];\n const inputDepth = (dataFormat ===
 `NHWC`) ? $x.shape[3] : $x.shape[1];\n util.assert(\n inputHeight * blockSize >= 0,\n () => `Negative
 dimension size caused by overflow when multiplying\n ${inputHeight} and ${blockSize} for depthToSpace with
 input shape\n ${$x.shape}`);\n util.assert(\n inputWidth * blockSize >= 0,\n () => `Negative dimension
 size caused by overflow when multiplying\n ${inputWidth} and ${blockSize} for depthToSpace with input
 shape\n ${$x.shape}`);\n util.assert(\n (inputDepth % (blockSize * blockSize) === 0),\n () =>
 `Dimension size must be evenly divisible by $\n blockSize * blockSize but is $\n inputDepth for
 depthToSpace with input shape ${$x.shape}`);\n const inputs: DepthToSpaceInputs = {x: $x};\n const attrs:
 DepthToSpaceAttrs = {blockSize, dataFormat};\n return ENGINE.runKernel(\n DepthToSpace, inputs as {}
 as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n}\n\nexport const depthToSpace =
op({depthToSpace_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
 under the Apache License, Version 2.0 (the `License`);\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an `AS IS` BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *

```

```

=====
*/\n\nimport {ENGINE} from './engine';\nimport {DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
 DepthwiseConv2dNativeInputs} from './kernel_names';\nimport {NamedAttrMap} from
 './kernel_registry';\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport
 * as util from './util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n *
 Depthwise 2D convolution.\n * Given a 4D `input` array and a `filter` array of shape\n * `[filterHeight, filterWidth,
 inChannels, channelMultiplier]` containing\n * `inChannels` convolutional filters of depth 1, this op applies a\n *
 different filter to each input channel (expanding from 1 channel to\n * `channelMultiplier` channels for each), then
 concatenates the results\n * together. The output has `inChannels * channelMultiplier` channels.\n * See\n *

```

[[https://www.tensorflow.org/api\\_docs/python/tf/nn/depthwise\\_conv2d](https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d)](\n \*  
[https://www.tensorflow.org/api\\_docs/python/tf/nn/depthwise\\_conv2d](https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d))\n \* for more details.\n \*\n \* @param x The input tensor, of rank 4 or rank 3, of shape\n \* \ `[batch, height, width, inChannels]`. If rank 3, batch of 1 is\n \* assumed.\n \* @param filter The filter tensor, rank 4, of shape\n \* \ `[filterHeight, filterWidth, inChannels, channelMultiplier]`. \n \* @param strides The strides of the convolution: \ `[strideHeight,\n \* strideWidth]`. If strides is a single number, then \ `strideHeight ==\n \* strideWidth`. \n \* @param pad The type of padding algorithm.\n \* - \ `same` and stride 1: output will be of same size as input,\n \* regardless of filter size.\n \* - \ `valid`: output will be smaller than input if filter is larger\n \* than 1x1.\n \* - For more info, see this guide:\n \* [[https://www.tensorflow.org/api\\_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution)](\n \*  
[https://www.tensorflow.org/api\\_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution))\n \* @param dilations The dilation rates: \ `[dilationHeight, dilationWidth]`\n \* in which we sample input values across the height and width dimensions\n \* in atrous convolution. Defaults to \ `[1, 1]`. If \ `rate` is a single\n \* number, then \ `dilationHeight == dilationWidth`. If it is greater than\n \* 1, then all values of \ `strides` must be 1.\n \* @param dataFormat: An optional string from: \ `\"NHWC\"`, \ `\"NCHW\"`. Defaults to\n \* \ `\"NHWC\"`. Specify the data format of the input and output data. With the\n \* default format \ `\"NHWC\"`, the data is stored in the order of: [batch,\n \* height, width, channels]. Only \ `\"NHWC\"` is currently supported.\n \* @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n \* provided, it will default to truncate.\n \*\n \* @doc {heading: 'Operations', subheading: 'Convolution'}\n \*\n function depthwiseConv2d<T extends Tensor3D|Tensor4D>(\n x: T|TensorLike, filter: Tensor4D|TensorLike,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n dilations: [number, number]|number = [1, 1],\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const \$x = convertToTensor(x, 'x', 'depthwiseConv2d');\n const \$filter = convertToTensor(filter, 'filter', 'depthwiseConv2d');\n let x4D = \$x as Tensor4D;\n let reshapedTo4D = false;\n if (\$x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape(\$x, [1, \$x.shape[0], \$x.shape[1], \$x.shape[2]]);\n }\n util.assert(\n x4D.rank === 4,\n () => `Error in depthwiseConv2d: input must be rank 4, but got ` +\n `rank \${x4D.rank}.`);\n util.assert(\n \$filter.rank === 4,\n () => `Error in depthwiseConv2d: filter must be rank 4, but got rank ` +\n `\${\$filter.rank}.`);\n util.assert(\n x4D.shape[3] === \$filter.shape[2],\n () => `Error in depthwiseConv2d: number of input channels ` +\n `\${x4D.shape[3]} must match the inChannels dimension in ` +\n `filter \${\$filter.shape[2]}.`);\n if (dimRoundingMode != null) {\n util.assert(\n util.isInt(pad as number),\n () => `Error in depthwiseConv2d: pad must be an integer when using, ` +\n `dimRoundingMode \${dimRoundingMode} but got pad \${pad}.`);\n }\n }\n const inputs: DepthwiseConv2dNativeInputs = {x: x4D, filter: \$filter};\n const attrs: DepthwiseConv2dNativeAttrs = {\n strides, pad, dataFormat, dilations, dimRoundingMode};\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n DepthwiseConv2dNative, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n }\n\n export const depthwiseConv2d = op({depthwiseConv2d\_});\n\n /\*\*\n \* @license\n \* Copyright 2020 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \ `License`);\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \*\n \* <http://www.apache.org/licenses/LICENSE-2.0>\n \*\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \ `AS IS` BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*\n \*=====\n \*\n import {ENGINE} from './engine';\n import {Diag, DiagInputs} from './kernel\_names';\n import {Tensor} from './tensor';\n import {NamedTensorMap} from './tensor\_types';\n import {convertToTensor} from './tensor\_util\_env';\n import {op} from './operation';\n\n /\*\*\n \* Returns a diagonal tensor with a given diagonal values.\n \*\n \* Given a diagonal, this operation returns a tensor with the diagonal and\n \* everything else padded with zeros.\n \*\n \* Assume the input has dimensions \ `[D1,..., Dk]`, then the output is a tensor\n \* of rank 2k with

dimensions `[D1,..., Dk, D1,..., Dk]`  
`const x = tf.tensor1d([1, 2, 3, 4]);`  
`tf.diag(x).print()`  
`const x = tf.tensor1d([1, 2, 3, 4, 5, 6, 6, 8], [4, 2]);`  
`tf.diag(x).print()`  
`@param x` The input tensor.  
`function diag\_(x: Tensor): Tensor`  
`const \$x = convertToTensor(x, 'x', 'diag');`  
`const inputs: DiagInputs = {x: \$x};`  
`return ENGINE.runKernel(Diag, inputs as {} as NamedTensorMap);`  
`export const diag = op({diag\_});`  
`/\*\*`  
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```
=====
import {ENGINE} from '../engine';
import {Dilation2D, Dilation2DAttrs, Dilation2DInputs} from
 '../kernel_names';
import {NamedAttrMap} from '../kernel_registry';
import {Tensor3D, Tensor4D} from
 '../tensor';
import {NamedTensorMap} from '../tensor_types';
import {convertToTensor} from
 '../tensor_util_env';
import {TensorLike} from '../types';
import * as util from '../util';
import {op} from
 '../operation';
import {reshape} from '../reshape';
/**
 * Computes the grayscale dilation over the input `x`.
 * @param x The input tensor, rank 3 or rank 4 of shape
 * `[batch, height, width, inChannels]`. If rank 3, batch
 * of 1 is assumed.
 * @param filter The filter tensor, rank 3, of shape
 * `[filterHeight, filterWidth, depth]`.
 * @param strides The strides of the sliding window for each dimension of the
 * input tensor: `[strideHeight,
 * strideWidth]`. If `strides` is a single number,
 * then `strideHeight == strideWidth`.
 * @param pad The type of padding algorithm.
 * - `same` and stride 1: output will be of same size as input,
 * regardless of filter size.
 * - `valid`: output will be smaller than input if filter is larger
 * than 1x1x1.
 * - For more info, see this guide:
 * [https://www.tensorflow.org/api_guides/python/nn#Convolution](
 * https://www.tensorflow.org/api_guides/python/nn#Convolution)
 * @param dataFormat Specify the data format of the input and output data.
 * Defaults to 'NHWC'. Only 'NHWC' is currently supported. With the
 * default format "NHWC", the data is stored in the order of: [batch,
 * height, width, channels].
 * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`
 * in which we sample input values across the height and width
 * dimensions for atrous morphological dilation. Defaults to `[1, 1]`.
 * If `dilations` is a single number, then `dilationHeight == dilationWidth`.
 * If it is greater than 1, then all values of `strides` must be 1.
 */
@doc {heading: 'Operations', subheading: 'Convolution'}
function dilation2d_<T extends Tensor3D|Tensor4D>(
 x: T|TensorLike, filter: Tensor3D|TensorLike,
 strides: [number, number]|number,
 pad: 'valid'|'same',
 dilations: [number, number]|number = [1, 1],
 dataFormat: 'NHWC' = 'NHWC'): T {
 const $x = convertToTensor(x, 'x', 'dilation2d');
 const $filter = convertToTensor(filter, 'filter', 'dilation2d');
 util.assert(
 $x.rank === 3 || $x.rank === 4,
 () => `Error in dilation2d: input must be rank 3 or 4, but got
 rank ` + $x.rank);
 util.assert(
 $filter.rank === 3,
 () => `Error in dilation2d: filter must be
 rank 3, but got rank ` + $filter.rank);
 util.assert(
 dataFormat === 'NHWC',
 () => `Error in dilation2d: Only NHWC is currently supported, ` +
 `but got dataFormat of ${dataFormat}`);
 let x4D = $x as Tensor4D;
 let reshapedTo4D = false;
 if ($x.rank === 3) {
 x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);
 reshapedTo4D = true;
 }
 const inputs: Dilation2DInputs = {x: x4D, filter: $filter};
 const attrs: Dilation2DAttrs = {strides, pad, dilations};
 // tslint:disable-next-line: no-unnecessary-type-assertion
 const res = ENGINE.runKernel(
 Dilation2D, inputs as {} as NamedTensorMap,
 attrs as {} as NamedAttrMap) as T;
 if (reshapedTo4D) {
 return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]
 as T);
 }
 return res;
}
export const dilation2d = op({dilation2d_});
/**
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 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 */
```

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```
=====
*/n/n/**n * Returns the dimensions in the input shape that are broadcasted to produce the provided output shape.
*/n * The returned dimensions are 0-indexed and sorted. An example: inShape = [4, 1, 3] outShape = [5, 4, 3, 3] result = [1]. Dimension 1 (2nd dimension of input) gets broadcasted 1 => 3.
*/n/nexport function getBroadcastDims(inShape: number[], outShape: number[]): number[] {
 const inRank = inShape.length;
 const dims: number[] = [];
 for (let i = 0; i < inRank; i++) {
 const dim = inRank - 1 - i;
 const a = inShape[dim] || 1;
 const b = outShape[outShape.length - 1 - i] || 1;
 if (b > 1 && a === 1) {
 dims.unshift(dim);
 }
 }
 return dims;
}

*/n/n/**n * Returns the axes in the output space that should be reduced to produce the input space.
*/n/nexport function getReductionAxes(inShape: number[], outShape: number[]): number[] {
 const result: number[] = [];
 for (let i = 0; i < outShape.length; i++) {
 const inDim = inShape[inShape.length - i - 1];
 const outAxis = outShape.length - i - 1;
 const outDim = outShape[outAxis];
 if (inDim === null || (inDim === 1 && outDim > 1)) {
 result.unshift(outAxis);
 }
 }
 return result;
}

*/n/nexport function assertAndGetBroadcastShape(shapeA: number[], shapeB: number[]): number[] {
 const result: number[] = [];
 const l = Math.max(shapeA.length, shapeB.length);
 for (let i = 0; i < l; i++) {
 let a = shapeA[shapeA.length - i - 1];
 if (a === null) {
 a = 1;
 }
 let b = shapeB[shapeB.length - i - 1];
 if (b === null) {
 b = 1;
 }
 if (a === 1) {
 result.unshift(b);
 } else if (b === 1) {
 result.unshift(a);
 } else if (a !== b) {
 const errMsg = `Operands could not be broadcast together with shapes ` +
 `${shapeA} and ${shapeB}`;
 throw Error(errMsg);
 } else {
 result.unshift(a);
 }
 }
 return result;
}

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*/n * software distributed under the License is distributed on an "AS IS" BASIS,
*/n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
*/n * See the License for the specific language governing permissions and
*/n * limitations under the License.
=====
```

```
=====
*/nimport {ENGINE} from './engine';
import {Equal, EqualInputs} from './kernel_names';
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {makeTypesMatch} from './tensor_util';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {assertAndGetBroadcastShape} from './broadcast_util';
import {op} from './operation';

*/n/n/**n * Returns the truth value of (a == b) element-wise. Supports broadcasting.
*/n * const a = tf.tensor1d([1, 2, 3]);
*/n * const b = tf.tensor1d([2, 2, 2]);
*/n * a.equal(b).print();
*/n * @param a The first input tensor.
*/n * @param b The second input tensor. Must have the same dtype as `a`.
*/n * @doc {heading: 'Operations', subheading: 'Logical'}

*/n/nfunction equal_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {
 let $a = convertToTensor(a, 'a', 'equal');
 let $b = convertToTensor(b, 'b', 'equal');
 [$a, $b] = makeTypesMatch($a, $b);
 assertAndGetBroadcastShape($a.shape, $b.shape);
 const inputs: EqualInputs = {a: $a, b: $b};
 return ENGINE.runKernel(Equal, inputs as { } as NamedTensorMap);
}

*/n/nexport const equal = op({equal_});

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*/n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
*/n * See the License for the specific language governing permissions and
*/n * limitations under the License.
=====
```

```
=====
*/nimport {ENGINE} from './engine';
import {Select, SelectInputs} from './kernel_names';
import {Tensor}
```

```

from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assert, assertShapesMatch} from
 './util';\n\nimport {broadcastTo} from './broadcast_to';\nimport {assertAndGetBroadcastShape} from
 './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the elements, either `a` or `b` depending on the
 `condition`.\n * If the condition is true, select from `a`, otherwise select from `b`.\n * `js` const cond =
 tf.tensor1d([false, false, true], 'bool');\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([-1, -2, -3]);\n *
 * a.where(cond, b).print();\n * ``\n * @param condition The input condition. Must be of dtype bool.\n *
 * @param a If `condition` is rank 1, `a` may have a higher rank but\n * its first dimension must match the size of
 `condition`.\n * @param b A tensor with the same dtype as `a` and with shape that is\n * compatible with `a`.\n *
 * @return A tensor with same dtype as `a` and `b`, and shape that is\n * broadcastable from `a` and `b`.\n *
 * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction where_<T extends Tensor>(\n condition:
 Tensor|TensorLike, a: T|TensorLike, b: T|TensorLike): T {\n const $a = convertToTensor(a, 'a', 'where');\n const $b
 = convertToTensor(b, 'b', 'where');\n const $condition = convertToTensor(condition, 'condition', 'where', 'bool');\n
 // TODO: move this logic to forward function when the broadcastTo op is\n // implemented in WASM.\n // Find
 the broadcastable shape for $a and $b.\n const broadcastShape = assertAndGetBroadcastShape($a.shape,
 $b.shape);\n const $broadcastedA = broadcastTo($a, broadcastShape);\n const $broadcastedB = broadcastTo($b,
 broadcastShape);\n if ($condition.rank === 1) {\n // If condition rank is 1, then the first dimension must match the
 size of\n // condition.\n assert(\n $condition.shape[0] === $a.shape[0],\n () => 'The first dimension of
 `a` must match the size of `condition`.');\n }\n if ($condition.rank !== 1) {\n // A must have the same shape as
 condition.\n assertShapesMatch(\n $condition.shape, $broadcastedB.shape, 'Error in where: ');
 }\n\n const
 inputs: SelectInputs = {\n condition: $condition,\n t: $broadcastedA,\n e: $broadcastedB\n };
 return
 ENGINE.runKernel(Select, inputs as unknown as NamedTensorMap);\n }\n\nexport const where =
 op({where_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
 Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *

```

```

=====\n
*\nimport {ENGINE} from './engine';\nimport {ZerosLike, ZerosLikeInputs} from './kernel_names';\nimport
 {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Creates a
 `tf.Tensor` with all elements set to 0 with the same shape as the\n * given tensor.\n * `js` const x =
 tf.tensor([1, 2]);\n * tf.zerosLike(x).print();\n * ``\n * @param x The tensor of required shape.\n *
 * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction zerosLike_<T extends Tensor>(x: T|TensorLike): T {\n
 const $x = convertToTensor(x, 'x', 'zerosLike');\n const inputs: ZerosLikeInputs = {x: $x};\n return
 ENGINE.runKernel(ZerosLike, inputs as { } as NamedTensorMap);\n }\n\nexport const zerosLike =
 op({zerosLike_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
 Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
 * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *

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```

=====\n
*\nimport {Tensor} from './tensor';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor}
 from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {div} from './div';\nimport {equal} from

```



```

./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
./tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
exponential linear element-wise: $x > 0 ? e^x - 1 : 0$.\n *\n * \`\`\`js\n * const x = tf.tensor1d([-1, 1, -3, 2]);\n *\n * x.elu().print(); // or tf.elu(x)\n *\n * \`\`\`\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction elu_http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Erf, ErfInputs} from './kernel_names';\nimport {Tensor} from
./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
./tensor_util_env';\nimport {TensorLike} from './types';\n\nimport * as util from './util';\n\nimport {cast} from
./cast';\nimport {op} from './operation';\n\n/**\n * Computes gauge error function of the input `tf.Tensor` element-
wise:\n * $\text{erf}(x)$ \n *\n * \`\`\`js\n * const x = tf.tensor1d([0, .1, -.1, .7]);\n *\n * x.erf().print(); // or tf.erf(x);\n *\n * \`\`\`\n *
@param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n *\nfunction erf_http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Exp, ExpInputs} from './kernel_names';\nimport {Tensor} from
./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
./tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
exponential of the input `tf.Tensor` element-wise. e^x \n *\n * \`\`\`js\n * const x = tf.tensor1d([1, 2, -3]);\n *\n * x.exp().print(); // or tf.exp(x)\n *\n * \`\`\`\n *
@param x The input tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction exp_http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs} from
./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport

```



```

{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Returns a
`tf.Tensor` that has expanded rank, by inserting a dimension\n * into the tensor's shape.\n * \n * ``js\n * const x =
tf.tensor1d([1, 2, 3, 4]);\n * const axis = 1;\n * x.expandDims(axis).print();\n * ``\n * \n * @param x The input
tensor whose dimensions to be expanded.\n * @param axis The dimension index at which to insert shape of `1`.
Defaults\n * to 0 (the first dimension).\n * \n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n
*\nfunction expandDims_<T extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x =
convertToTensor(x, 'x', 'expandDims', 'string_or_numeric');\n util.assert(axis <= $x.rank, () => 'Axis must be <=
rank of the tensor');\n\n const inputs: ExpandDimsInputs = {input: $x};\n const attrs: ExpandDimsAttrs = {dim:
axis};\n\n return ENGINE.runKernel(\n ExpandDims, inputs as { } as NamedTensorMap, attrs as { } as
NamedAttrMap);\n}\n\nexport const expandDims = op({expandDims_});\n"/**\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {ENGINE} from './engine';\nimport {Expml, ExpmlInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
exponential of the input `tf.Tensor` minus one element-wise.\n * \n * `e ^ x - 1`\n * \n * ``js\n * const x = tf.tensor1d([1,
2, -3]);\n * x.expml().print(); // or tf.expml(x)\n * ``\n * \n * @param x The input tensor.\n * \n * @doc {heading:
'Operations', subheading: 'Basic math'}\n *\nfunction expml_<T extends Tensor>(x: T|TensorLike): T {\n const $x
= convertToTensor(x, 'x', 'expml');\n\n const inputs: ExpmlInputs = {x: $x};\n return ENGINE.runKernel(Expml,
inputs as { } as NamedTensorMap);\n}\n\nexport const expml = op({expml_});\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {ENGINE} from './engine';\nimport {Tile, TileAttrs, TileInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport
 * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Construct a tensor by repeating it the number of
times given by reps.\n * \n * This operation creates a new tensor by replicating `input` `reps`\n * times. The output
tensor's i'th dimension has `input.shape[i] * reps[i]` elements, and the values of `input` are replicated\n *
`reps[i]` times along the i'th dimension. For example, tiling\n * `[a, b, c, d]` by `[2]` produces `[a, b, c, d, a, b, c,
d]`.\n * \n * ``js\n * const a = tf.tensor1d([1, 2]);\n * a.tile([2]).print(); // or a.tile([2])\n * ``\n * \n * ``js\n *
const a = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * a.tile([1, 2]).print(); // or a.tile([1, 2])\n * ``\n * \n * @param x The
tensor to tile.\n * @param reps Determines the number of replications per dimension.\n * \n * @doc {heading:
'Tensors', subheading: 'Slicing and Joining'}\n *\nfunction tile_<T extends Tensor>(x: T|TensorLike, reps:
number[]): T {\n const $x = convertToTensor(x, 'x', 'tile', 'string_or_numeric');\n util.assert(\n $x.rank ===
reps.length,\n () => `Error in transpose: rank of input ${$x.rank}` +\n ` must match length of reps
${reps}.`);\n\n const inputs: TileInputs = {x: $x};\n const attrs: TileAttrs = {reps};\n\n return
ENGINE.runKernel(\n Tile, inputs as unknown as NamedTensorMap,\n attrs as unknown as

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NamedAttrMap);\n}\n\nexport const tile = op({tile\_});\n", "/\*\n \* @license\n \* Copyright 2020 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the "License");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* \n \* http://www.apache.org/licenses/LICENSE-2.0\n \* \n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an "AS IS" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {Tensor2D} from './tensor';\nimport {DataType} from './types';\nimport {buffer} from './buffer';\nimport {expandDims} from './expand_dims';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {tile} from './tile';\n\n/**\n * Create an identity matrix.\n *\n * @param numRows Number of rows.\n * @param numColumns Number of columns. Defaults to `numRows`.\n * @param batchSize If provided, will add the batch shape to the beginning\n * of the shape of the returned `tf.Tensor` by repeating the identity\n * matrix.\n * @param dtype Data type.\n * @returns Identity matrix of the specified size and data type, possibly\n * with batch repetition if `batchShape` is specified.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction eye_(\n numRows: number, numColumns?: number, batchSize?:\n [number,\n number][number, number, number][number, number, number, number],\n dtype: DataType = 'float32'): Tensor2D {\n if (numColumns == null) {\n numColumns = numRows;\n }\n const buff =\n buffer([numRows, numColumns], dtype);\n const n = numRows <= numColumns ? numRows : numColumns;\n for (let i = 0; i < n; ++i) {\n buff.set(1, i, i);\n }\n const out: Tensor2D = reshape(buff.toTensor(), [numRows,\n numColumns]);\n if (batchShape == null) {\n return out;\n } else {\n if (batchShape.length === 1) {\n return\n tile(expandDims(out, 0), [batchShape[0], 1, 1]) as Tensor2D;\n } else if (batchShape.length === 2) {\n //\n tslint:disable-next-line:no-unnecessary-type-assertion\n return tile(\n expandDims(expandDims(out, 0),\n [batchShape[0], batchShape[1], 1, 1]) as Tensor2D;\n } else if (batchShape.length === 3) {\n //\n tslint:disable-next-line:no-unnecessary-type-assertion\n return tile(expandDims(expandDims(expandDims(out,\n 0), 0), 0), [batchShape[0], batchShape[1], batchShape[2], 1,\n 1]) as Tensor2D;\n } else {\n throw new Error(\n `eye() currently supports only 1D and 2D` +\n // tslint:disable-next-line:no-any\n `batchShapes, but received ${batchShape as any}.length`);\n }\n }\n}\n\nexport const eye =\n op({eye_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Fill, FillAttrs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {DataType, Rank, ShapeMap} from './types';\n\n/**\n * Creates a `tf.Tensor` filled with a scalar value.\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param value The scalar value to fill the tensor with.\n * @param dtype The type of an element in the resulting tensor. Defaults to\n * `float`.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction fill<R extends Rank>(\n shape: ShapeMap[R], value: number|string, dtype?:\n DataType): Tensor<R> {\n const attrs: FillAttrs = {shape, value, dtype};\n return ENGINE.runKernel(Fill, {}, attrs as {} as NamedAttrMap);\n}\n\nexport {fill};\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n\n*\nimport {ENGINE} from './engine';\nimport {Floor, FloorInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes floor of input `tf.Tensor` element-wise: `floor(x)`.\n *\n * ```js\n * const x = tf.tensor1d([.6, 1.1, -3.3]);\n * x.floor().print(); // or tf.floor(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction floor_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'floor');\n const inputs: FloorInputs = {x: $x};\n return ENGINE.runKernel(Floor, inputs as {} as NamedTensorMap);\n}\n\nexport const floor = op({floor_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\nimport {ENGINE} from './engine';\nimport {GatherV2, GatherV2Attrs, GatherV2Inputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Gather slices from tensor `x`'s axis `axis` according to `indices`.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * const indices = tf.tensor1d([1, 3, 3, 'int32']);\n * x.gather(indices).print();\n * ```\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const indices = tf.tensor1d([1, 1, 0], 'int32');\n * x.gather(indices).print();\n * ```\n * @param x The input tensor whose slices to be gathered.\n * @param indices The indices of the values to extract.\n * @param axis The axis over which to select values. Defaults to 0.\n * @param batchDims Optional. The number of batch dimensions. It must be less\n * than or equal to rank(indices). Defaults to 0.\n * The output tensor will have shape of\n * `x.shape[:axis] + indices.shape[batchDims:] + x.shape[axis + 1:]`\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction gather_<T extends Tensor>(x: T|TensorLike, indices: Tensor|TensorLike, axis = 0, batchDims = 0): T {\n const $x = convertToTensor(x, 'x', 'gather');\n const $indices = convertToTensor(indices, 'indices', 'gather', 'int32');\n const inputs: GatherV2Inputs = {x: $x, indices: $indices};\n const attrs: GatherV2Attrs = {axis, batchDims};\n return ENGINE.runKernel(GatherV2, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const gather = op({gather_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\nimport {ENGINE} from './engine';\nimport {Greater, GreaterInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of (a > b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n * a.greater(b).print();\n * ```\n * @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\n
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*\nfunction greater_<T extends Tensor>(n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a =
convertToTensor(a, 'a', 'greater');\n let $b = convertToTensor(b, 'b', 'greater');\n [$a, $b] = makeTypesMatch($a,
$b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: GreaterInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Greater, inputs as { } as NamedTensorMap);\n}\n\n\nexport const greater =
op({greater_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\nimport {ENGINE} from './engine';\nimport {GreaterEqual, GreaterEqualInputs} from
'./kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport
{makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from
'./operation';\n\n/**\n * Returns the truth value of (a >= b) element-wise. Supports broadcasting.\n *\n * ```\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n *\n * a.greaterEqual(b).print();\n * ```\n *\n * @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction greaterEqual_<T extends Tensor>(n a:
Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'greaterEqual');\n let $b =
convertToTensor(b, 'b', 'greaterEqual');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: GreaterEqualInputs = {a: $a, b: $b};\n\n return
ENGINE.runKernel(GreaterEqual, inputs as { } as NamedTensorMap);\n}\n\n\nexport const greaterEqual =
op({greaterEqual_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport {ENGINE} from './engine';\nimport {Imag, ImagInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
'./tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns the
imaginary part of a complex (or real) tensor.\n *\n * Given a tensor input, this operation returns a tensor of type float
that is\n * the imaginary part of each element in input considered as a complex number.\n * If input is real, a tensor
of all zeros is returned.\n *\n * ```\n * const x = tf.complex([-2.25, 3.25], [4.75, 5.75]);\n * tf.imag(x).print();\n *
```\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction imag_<T extends Tensor>(input:
T|TensorLike): T {\n  const $input = convertToTensor(input, 'input', 'imag');\n\n  const inputs: ImagInputs = {input:
$input};\n  return ENGINE.runKernel(Imag, inputs as { } as NamedTensorMap);\n}\n\n\nexport const imag =
op({imag_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport {ENGINE} from './engine';\nimport {IsFinite, IsFiniteInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Returns
which elements of x are finite.\n *`js\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n *\n *
x.isFinite().print(); // or tf.isNaN(x)\n *`*\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction isFinite_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'isFinite');\n\n const inputs: IsFiniteInputs = {x: $x};\n\n return
ENGINE.runKernel(IsFinite, inputs as { } as NamedTensorMap);\n}\n\nexport const isFinite =
op({isFinite_});\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {IsInf, IsInfInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Returns
which elements of x are Infinity or -Infinity.\n *`js\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n *\n *
x.isInf().print(); // or tf.isNaN(x)\n *`*\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction isInf_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'isInf');\n\n const inputs: IsInfInputs = {x: $x};\n\n return ENGINE.runKernel(IsInf, inputs
as { } as NamedTensorMap);\n}\n\nexport const isInf = op({isInf_});\n", "/**\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {IsNaN, IsNaNInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * RRReturns
which elements of x are NaN.\n *`js\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n *\n *
x.isNaN().print(); // or tf.isNaN(x)\n *`*\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction isNaN_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'isNaN');\n\n const inputs: IsNaNInputs = {x: $x};\n\n return ENGINE.runKernel(IsNaN,
inputs as { } as NamedTensorMap);\n}\n\nexport const isNaN = op({isNaN_});\n", "/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {LeakyRelu, LeakyReluAttrs, LeakyReluInputs} from

```

```

'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes leaky rectified linear element-
wise.\n *\n * See\n * [http://web.stanford.edu/~awni/papers/relu_hybrid_icml2013_final.pdf](\n *
http://web.stanford.edu/~awni/papers/relu_hybrid_icml2013_final.pdf)\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -
3, 4]);\n *\n * x.leakyRelu(0.1).print(); // or tf.leakyRelu(x, 0.1)\n *\n * ```\n *\n * @param x The input tensor.\n *\n * @param
alpha The scaling factor for negative values, defaults to 0.2.\n *\n * @doc {heading: 'Operations', subheading: 'Basic
math'}\n *\n */\nfunction leakyRelu_<T extends Tensor>(x: T|TensorLike, alpha = 0.2): T {\n  const $x =
convertToTensor(x, 'x', 'leakyRelu');\n  \n  const inputs: LeakyReluInputs = {x: $x};\n  const attrs: LeakyReluAttrs =
{alpha};\n  \n  return ENGINE.runKernel(\n    LeakyRelu, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\nexport const leakyRelu = op({leakyRelu_});\n\n"/**\n *\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version 2.0 (the "License");\n *\n * you
may not use this file except in compliance with the License.\n *\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n *\n * distributed under the License is distributed on an "AS IS" BASIS,\n *\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n *\n * See the License for the specific language
governing permissions and\n *\n * limitations under the License.\n *\n

```

```

=====\n
*\nimport {ENGINE} from './engine';\nimport {Less, LessInputs} from './kernel_names';\nimport {Tensor} from
'./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
'./tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
{assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n *\n * Returns the truth
value of (a < b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n *\n * const b =
tf.tensor1d([2, 2, 2]);\n *\n * a.less(b).print();\n *\n * ```\n *\n * @param a The first input tensor.\n *\n * @param b The second
input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n *\n */\nfunction less_<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let $a =
convertToTensor(a, 'a', 'less');\n  let $b = convertToTensor(b, 'b', 'less');\n  [$a, $b] = makeTypesMatch($a, $b);\n  \n  assertAndGetBroadcastShape($a.shape, $b.shape);\n  \n  const inputs: LessInputs = {a: $a, b: $b};\n  \n  return
ENGINE.runKernel(Less, inputs as {} as NamedTensorMap);\n}\n\nexport const less = op({less_});\n\n"/**\n *\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version
2.0 (the "License");\n *\n * you may not use this file except in compliance with the License.\n *\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n *\n * distributed under the License is distributed on an "AS IS" BASIS,\n *\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n *\n * See the License for the specific language
governing permissions and\n *\n * limitations under the License.\n *\n

```

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=====\n
*\nimport {ENGINE} from './engine';\nimport {LessEqual, LessEqualInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
'./tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
{assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n *\n * Returns the truth
value of (a <= b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n *\n * const b =
tf.tensor1d([2, 2, 2]);\n *\n * a.lessEqual(b).print();\n *\n * ```\n *\n * @param a The first input tensor.\n *\n * @param b
The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading:
'Logical'}\n *\n */\nfunction lessEqual_<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let
$a = convertToTensor(a, 'a', 'lessEqual');\n  let $b = convertToTensor(b, 'b', 'lessEqual');\n  [$a, $b] =
makeTypesMatch($a, $b);\n  \n  assertAndGetBroadcastShape($a.shape, $b.shape);\n  \n  const inputs:
LessEqualInputs = {a: $a, b: $b};\n  \n  return ENGINE.runKernel(LessEqual, inputs as {} as
NamedTensorMap);\n}\n\nexport const lessEqual = op({lessEqual_});\n\n"/**\n *\n * @license\n * Copyright 2018

```

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```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {LinSpace, LinSpaceAttrs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor1D} from './tensor';\n\n/**\n * Return an evenly spaced sequence of numbers over the given interval.\n *\n * ``js\n * tf.linspace(0, 9, 10).print();\n * ``\n *\n * @param start The start value of the sequence.\n * @param stop The end value of the sequence.\n * @param num The number of values to generate.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function linspace(start: number, stop: number, num: number): Tensor1D {\n  if (num <= 0) {\n    throw new Error("The number of values should be positive.");\n  }\n\n  const attrs: LinSpaceAttrs = {start, stop, num};\n  return ENGINE.runKernel(LinSpace, {}, attrs as {} as NamedAttrMap);\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {LRN, LRNAttrs, LRNInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Normalizes the activation of a local neighborhood across or within\n * channels.\n *\n * @param x The input tensor. The 4-D input tensor is treated as a 3-D array\n * of 1D vectors (along the last dimension), and each vector is\n * normalized independently.\n * @param depthRadius The number of adjacent channels in the 1D normalization\n * window.\n * @param bias A constant bias term for the basis.\n * @param alpha A scale factor, usually positive.\n * @param beta An exponent.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction localResponseNormalization_<T extends Tensor3D|Tensor4D>(\n  x: T|TensorLike, depthRadius = 5, bias = 1, alpha = 1, beta = 0.5): T {\n  const $x = convertToTensor(x, 'x', 'localResponseNormalization');\n  util.assert(($x.rank === 4 || $x.rank === 3, () => `Error in localResponseNormalization: x must be rank 3 or 4 but got\n    rank ${$x.rank}.`));\n  util.assert((\n    util.isInt(depthRadius),\n    () => `Error in localResponseNormalization: depthRadius must be an\n    `integer but got depthRadius ${depthRadius}.`));\n\n  let x4D = $x as Tensor4D;\n  let reshapedTo4D = false;\n  if ($x.rank === 3) {\n    reshapedTo4D = true;\n    x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n  }\n\n  const inputs: LRNInputs = {x: x4D};\n  const attrs: LRNAttrs = {depthRadius, bias, alpha, beta};\n\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  const res = ENGINE.runKernel(LRN, inputs as {} as NamedTensorMap,\n    attrs as {} as NamedAttrMap) as T;\n\n  if (reshapedTo4D) {\n    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n  } else {\n    return res;\n  }\n}\n\nexport const localResponseNormalization = op({localResponseNormalization_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {Log, LogInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes natural logarithm of the input `tf.Tensor` element-wise:  $\ln(x)$ \n *  $\text{const } x = \text{tf.tensor1d}([1, 2, \text{Math.E}]);$ \n *  $x.\text{log}().\text{print}();$  // or  $\text{tf.log}(x)$ \n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n\nfunction log_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'log');\n  const inputs: LogInputs = {x: $x};\n  return ENGINE.runKernel(Log, inputs as { } as NamedTensorMap);\n}\n\nexport const log = op({log_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {Log1p, Log1pInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes natural logarithm of the input `tf.Tensor` plus one\n * element-wise:  $\ln(1 + x)$ \n *  $\text{const } x = \text{tf.tensor1d}([1, 2, \text{Math.E} - 1]);$ \n *  $x.\text{log1p}().\text{print}();$  // or  $\text{tf.log1p}(x)$ \n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n\nfunction log1p_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'log1p');\n  const inputs: Log1pInputs = {x: $x};\n  return ENGINE.runKernel(Log1p, inputs as { } as NamedTensorMap);\n}\n\nexport const log1p = op({log1p_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {CustomGradientFunc, ENGINE} from './engine';\nimport {Scalar, Tensor, Variable} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor, convertToTensorArray} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\n/**\n * Provided `f(x)`, returns another function `g(x, dy?)`, which gives the\n * gradient of `f(x)` with respect to `x`. If `dy` is provided, the\n * gradient of `f(x).mul(dy).sum()` with respect to `x` is computed\n * instead. `f(x)` must take a single tensor `x` and return a single\n * tensor `y`. If `f()` takes multiple inputs, use `tf.grads` instead.\n *  $f(x) = x^2$   $\text{const } f = x \Rightarrow x.\text{square}();$ \n *  $f(x) = 2x$   $\text{const } g = \text{tf.grad}(f);$   $\text{const } x = \text{tf.tensor1d}([2, 3]);$ \n *  $g(x).\text{print}();$ \n *  $f(x) = x^3$   $\text{const } f = x \Rightarrow x.\text{pow}(\text{tf.scalar}(3, 'int32'));$ \n *  $f(x) = 3x^2$   $\text{const } g = \text{tf.grad}(f);$   $f'(x) = 6x$   $\text{const } gg = \text{tf.grad}(g);$ \n *  $\text{const } x = \text{tf.tensor1d}([2, 3]);$   $gg(x).\text{print}();$ \n * @param f The function f(x), to compute gradient for.\n * @doc {heading: 'Training', subheading: 'Gradients'}\n\nfunction grad(f: (x: Tensor) => Tensor): (\n  x: TensorLike|Tensor, dy?:\n  TensorLike|Tensor) => Tensor {\n  util.assert(util.isFunction(f), () => 'The f passed in grad(f) must be a function');\n  return (x: TensorLike|Tensor, dy?: TensorLike|Tensor): Tensor => {\n    // x can be of any dtype, thus null as the last argument.\n    const $x = convertToTensor(x, 'x', 'tf.grad', 'string_or_numeric');\n    const $dy: Tensor =\n      (dy != null) ? convertToTensor(dy, 'dy', 'tf.grad') : null;\n    return ENGINE.tidy(() => {\n      const {value, grads} = ENGINE.gradients(() => f($x), [$x], $dy);\n      if ($dy != null) {\n
```



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value.shape, $dy.shape,\n      'The shape of dy passed in grad(f)(x, dy) must match the shape '+\n
'returned by f(x)');\n    }\n    checkGrads(grads);\n    return grads[0];\n  });\n};\n\n\n/**\n * Provided `f(x1, x2,...)`, returns another function `g([x1, x2,...], dy?)` which gives an array of gradients of `f()` with respect to each input\n * `[x1, `x2`, ...]`. \n * If `dy` is passed when calling `g()`, the gradient of `f(x1,...).mul(dy).sum()` with respect to each input is computed instead.\n * The provided `f` must take one or more tensors and return a single tensor\n * `y`. If `f()` takes a single input, we recommend using `tf.grad` instead.\n *\n * `js` \n * // f(a, b) = a * b\n * const f = (a, b) => a.mul(b);\n * // df/da = b, df/db = a\n * const g = tf.grads(f);\n *\n * const a = tf.tensor1d([2, 3]);\n * const b = tf.tensor1d([-2, -3]);\n * const [da, db] = g([a, b]);\n * console.log('da');\n * da.print();\n * console.log('db');\n * db.print();\n *``\n *\n * @param f The function `f(x1, x2,...)` to compute gradients for.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\nfunction grads(f: (...args: Tensor[]) => Tensor): (\n  args: Array<Tensor|TensorLike>, dy?: Tensor|TensorLike) => Tensor[] {\n  util.assert(\n    util.isFunction(f), () => 'The f passed in grads(f) must be a function');\n  return (args: Array<Tensor|TensorLike>, dy?: Tensor|TensorLike): Tensor[] => {\n    util.assert(\n      Array.isArray(args),\n      () => 'The args passed in grads(f)(args) must be an array '+\n        'of `Tensor`s or `TensorLike`s');\n    // args can be of any dtype, thus null as the last argument.\n    const $args =\n      convertToTensorArray(args, 'args', 'tf.grads', 'string_or_numeric');\n    const $dy: Tensor =\n      (dy != null) ? convertToTensor(dy, 'dy', 'tf.grads') : null;\n    return ENGINE.tidy(() => {\n      const { value, grads } = ENGINE.gradients(() => f(...$args), $args, $dy);\n      if ($dy != null) {\n        util.assertShapesMatch(\n          value.shape, $dy.shape,\n          'The shape of dy passed in grads(f)([x1,...], dy) must '+\n            'match the shape returned by f([x1,...])');\n      }\n      checkGrads(grads);\n      return grads;\n    });\n  });\n}\n\n\n/**\n * Like `tf.grad`, but also returns the value of `f()`. Useful when `f()` returns a metric you want to show.\n *\n * The result is a rich object with the following properties:\n * - grad: The gradient of `f(x)` w.r.t `x` (result of `tf.grad`).\n * - value: The value returned by `f(x)`. \n *\n * `js` \n * // f(x) = x ^ 2\n * const f = x => x.square();\n * // f'(x) = 2x\n * const g = tf.valueAndGrad(f);\n *\n * const x = tf.tensor1d([2, 3]);\n * const { value, grad } = g(x);\n * console.log('value');\n * value.print();\n * console.log('grad');\n * grad.print();\n *``\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\nfunction valueAndGrad<I extends Tensor, O extends Tensor>(f: (x: I) => O): (\n  x: I, dy?: O) => {\n  value: O;\n  grad: I;\n  }\n  {\n    util.assert(\n      util.isFunction(f),\n      () => 'The f passed in valueAndGrad(f) must be a function');\n    return (x: I, dy?: O) => {\n      util.assert(\n        x instanceof Tensor,\n        () => 'The x passed in valueAndGrad(f)(x) must be a tensor');\n      util.assert(\n        dy == null || dy instanceof Tensor,\n        () => 'The dy passed in valueAndGrad(f)(x, dy) must be a tensor');\n      const { grads, value } = ENGINE.gradients(() => f(x), [x], dy);\n      checkGrads(grads);\n      return { grad: grads[0] as I, value};\n    });\n  });\n}\n\n\n/**\n * Like `tf.grads`, but returns also the value of `f()`. Useful when `f()` returns a metric you want to show.\n *\n * The result is a rich object with the following properties:\n * - grads: The gradients of `f()` w.r.t each input (result of `tf.grads`).\n * - value: The value returned by `f(x)`. \n *\n * `js` \n * // f(a, b) = a * b\n * const f = (a, b) => a.mul(b);\n * // df/da = b, df/db = a\n * const g = tf.valueAndGrads(f);\n *\n * const a = tf.tensor1d([2, 3]);\n * const b = tf.tensor1d([-2, -3]);\n * const { value, grads } = g([a, b]);\n *\n * const [da, db] = grads;\n *\n * console.log('value');\n * value.print();\n *\n * console.log('da');\n * da.print();\n * console.log('db');\n * db.print();\n *``\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\nfunction valueAndGrads<O extends Tensor>(f: (...args: Tensor[]) => O): (\n  args: Tensor[], dy?: O) => {\n  grads: Tensor[];\n  value: O;\n  }\n  {\n    util.assert(\n      util.isFunction(f),\n      () => 'The f passed in valueAndGrads(f) must be a function');\n    return (args: Tensor[], dy?: O) => {\n      util.assert(\n        Array.isArray(args) && args.every(arg => arg instanceof Tensor),\n        () => 'The args passed in valueAndGrads(f)(args) must be array of '+\n          'tensors');\n      util.assert(\n        dy == null || dy instanceof Tensor,\n        () => 'The dy passed in valueAndGrads(f)(args, dy) must be a tensor');\n      const res = ENGINE.gradients(() => f(...args), args, dy);\n      if (dy != null) {\n        util.assertShapesMatch(\n          res.value.shape, dy.shape,\n          'The shape of dy passed in valueAndGrads(f)([x1,...], dy) must '+\n            'match the shape returned by f([x1,...])');\n      }\n      checkGrads(res.grads);\n      return res;\n    });\n  });\n}\n\n\n/**\n * Computes and returns the gradient of f(x) with respect to the list of trainable variables provided by `varList`. If no list is provided, it defaults to all trainable variables.\n *\n * `js` \n * const a = tf.variable(tf.tensor1d([3, 4]));\n * const b = tf.variable(tf.tensor1d([5, 6]));\n *

```

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const x = tf.tensor1d([1, 2]);\n * \n * // f(a, b) = a * x ^ 2 + b * x\n * const f = () =>
a.mul(x.square()).add(b.mul(x)).sum();\n * // df/da = x ^ 2, df/db = x\n * const { value, grads } =
tf.variableGrads(f);\n * \n * Object.keys(grads).forEach(varName => grads[varName].print());\n * ```\n * \n *
@param f The function to execute. f() should return a scalar.\n * @param varList The list of variables to compute
the gradients with respect\n * to. Defaults to all trainable variables.\n * @returns An object with the following
keys and values:\n * - `value`: The value of the function `f`.\n * - `grads`: A map from the names of the variables
to the gradients.\n * If the `varList` argument is provided explicitly and contains a subset of\n * non-trainable
variables, this map in the return value will contain keys\n * that map the names of the non-trainable variables to
`null`.\n * \n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\nfunction variableGrads(f: () => Scalar,
varList?: Variable[]):\n { value: Scalar, grads: NamedTensorMap } {\n util.assert(\n util.isFunction(f),\n ()
=> 'The f passed in variableGrads(f) must be a function');\n util.assert(\n varList == null ||\n
Array.isArray(varList) && varList.every(v => v instanceof Variable),\n () =>\n 'The varList passed in
variableGrads(f, varList) must be an array ' +\n 'of variables');\n\n const specifiedVarList = varList != null;\n
if (!specifiedVarList) {\n // Get all of the trainable variables.\n varList = [];\n for (const varName in
ENGINE.registeredVariables) {\n varList.push(ENGINE.registeredVariables[varName]);\n }\n }\n\n const
specifiedNonTrainable: Variable[] =\n specifiedVarList ? varList.filter(variable => !variable.trainable) : null;\n\n
// Prune non-trainable variables.\n const originalVarCount = varList.length;\n varList = varList.filter(variable =>
variable.trainable);\n util.assert(\n varList.length > 0,\n () => `variableGrads() expects at least one of the input
variables to ` +\n `be trainable, but none of the ${originalVarCount} variables is ` +\n `trainable.`);\n\n
const allowNoGradients = true;\n const { value, grads } = ENGINE.gradients(f, varList, null, allowNoGradients);\n\n
util.assert(\n grads.some(g => g != null),\n () => 'Cannot find a connection between any variable and the result
of ' +\n 'the loss function y=f(x). Please make sure the operations that ' +\n 'use variables are inside the
function f passed to minimize().');\n util.assert(\n value.rank === 0,\n () => `The f passed in variableGrads(f)
must return a scalar, but it ` +\n `returned a rank-${value.rank} tensor`);\n\n const namedGrads:
NamedTensorMap = {};\n varList.forEach((v, i) => {\n if (grads[i] != null) {\n namedGrads[v.name] =
grads[i];\n }\n });\n if (specifiedNonTrainable != null) {\n // If varList is explicitly provided and contains non-
trainable values,\n // add them to the returned gradients with `null` values.\n specifiedNonTrainable.forEach(v
=> namedGrads[v.name] = null);\n }\n return { value, grads: namedGrads};\n }\n\n/**\n * Overrides the gradient
computation of a function `f`.\n * \n * Takes a function\n * `f(...inputs, save) => { value: Tensor, gradFunc: (dy,
saved) => Tensor[]}`\n * and returns another function `g(...inputs)` which takes the same inputs as\n * `f`. When
called, `g` returns `f().value`. In backward mode, custom gradients\n * with respect to each input of `f` are computed
using `f().gradFunc`.\n * \n * The `save` function passed to `f` should be used for saving tensors needed\n * in the
gradient. And the `saved` passed to the `gradFunc` is a\n * `NamedTensorMap`, which contains those saved
tensor.\n * \n * ```\n * const customOp = tf.customGrad((x, save) => {\n * // Save x to make sure it's available
later for the gradient.\n * save([x]);\n * // Override gradient of our custom x ^ 2 op to be dy * abs(x);\n * return
{\n * value: x.square(),\n * // Note `saved.x` which points to the `x` we saved earlier.\n * gradFunc: (dy,
saved) => [dy.mul(saved[0].abs())]\n * }; \n * });\n * \n * const x = tf.tensor1d([-1, -2, 3]);\n * const dx = tf.grad(x
=> customOp(x));\n * console.log(`f(x):`);\n * customOp(x).print();\n * console.log(`f'(x):`);\n * dx(x).print();\n *
```\n * \n * @param f The function to evaluate in forward mode, which should return\n * `{ value: Tensor,
gradFunc: (dy, saved) => Tensor[]}`, where `gradFunc`\n * returns the custom gradients of `f` with respect to its
inputs.\n * \n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\nfunction customGrad<T> extends
Tensor>(f: CustomGradientFunc<T>):\n (...args: Tensor[]) => T {\n return
ENGINE.customGrad(f);\n }\n\nfunction checkGrads(grads: Tensor[]) {\n const numNullGradients = grads.filter(g
=> g == null).length;\n if (numNullGradients > 0) {\n throw new Error(\n `Cannot compute gradient of
y=f(x) with respect to x. Make sure that\n the f you passed encloses all operations that lead from x to y.`);\n
}\n }\n\nexport {\n customGrad,\n variableGrads,\n valueAndGrad,\n valueAndGrads,\n grad,\n
grads,\n};\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the `License`);\n * you may not use this file except in compliance with the

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License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \*\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Neg, NegInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes x element-wise.\n *\n * ```js\n * const x = tf.tensor2d([1, 2, -2, 0], [2, 2]);\n * x.neg().print(); // or tf.neg(x)\n * ```\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction neg_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'neg');\n const inputs: NegInputs = {x: $x};\n return ENGINE.runKernel(Neg, inputs as {} as NamedTensorMap);\n}\n\nexport const neg = op({neg_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

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=====\n*\n\nimport {ENGINE} from './engine';\nimport {Softplus, SoftplusInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes softplus of the input $tf.Tensor$ element-wise: $\\log(\\exp(x) + 1)$ \n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n * x.softplus().print(); // or tf.softplus(x)\n * ```\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction softplus_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'softplus');\n const inputs: SoftplusInputs = {x: $x};\n return ENGINE.runKernel(Softplus, inputs as {} as NamedTensorMap);\n}\n\nexport const softplus = op({softplus_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

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=====\n*\n\nimport {customGrad} from './gradients';\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {mul} from './mul';\nimport {neg} from './neg';\nimport {op} from './operation';\nimport {sigmoid} from './sigmoid';\nimport {softplus} from './softplus';\n\n/**\n * Computes log sigmoid of the input $tf.Tensor$ element-wise:\n * $\\log\\text{Sigmoid}(x)$. For numerical stability, we use $-tf.softplus(-x)$ \n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n * x.logSigmoid().print(); // or tf.logSigmoid(x)\n * ```\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction logSigmoid_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'logSigmoid');\n // Use a custom gradient to maintain previous implementation.\n // There is no LogSigmoid kernel in TF so we can't use engine.runKernel\n // directly\n const customOp = customGrad((x: Tensor) => {\n // TODO(yassogba) we can remove the chained softplus call here\n // only\n // after backends have modularized softplus at which point we can call\n // engine.runKernel(..., Softplus,\n
```

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...) directly.\n const value = neg(softplus(neg(x))); \n\n const gradFunc = (dy: T) => { \n const derX = mul(dy, \n sigmoid(neg(x))); \n return derX; \n }; \n return {value, gradFunc}; \n }; \n\n return customOp($x) as \n T; \n } \n\n export const logSigmoid = op({logSigmoid_}); \n\n"/** \n * @license \n * Copyright 2020 Google LLC. All \n Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the "License"); \n * you may not use this \n file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n * \n http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or agreed to in writing, \n software \n * distributed under the License is distributed on an "AS IS" BASIS, \n * WITHOUT WARRANTIES \n OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language \n governing permissions and \n * limitations under the License. \n * \n
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```
===== \n\n*/ \n\nimport {ENGINE} from '../engine'; \nimport {Max, MaxAttrs, MaxInputs} from '../kernel_names'; \nimport \n {NamedAttrMap} from '../kernel_registry'; \nimport {Tensor} from '../tensor'; \nimport {NamedTensorMap} from \n '../tensor_types'; \nimport {convertToTensor} from '../tensor_util_env'; \nimport {TensorLike} from \n '../types'; \n\nimport {op} from './operation'; \n\n/** \n * Computes the maximum of elements across dimensions of a \n `tf.Tensor`. \n * \n * Reduces the input along the dimensions given in `axes`. Unless `keepDims` \n * is true, the rank \n of the `tf.Tensor` is reduced by 1 for each entry in \n * `axes`. If `keepDims` \n is true, the reduced dimensions are \n retained with \n * length 1. If `axes` \n has no entries, all dimensions are reduced, and an \n * `tf.Tensor` \n with a single \n element is returned. \n\n * \n * `js` \n * const x = tf.tensor1d([1, 2, 3]); \n * \n * x.max().print(); // or tf.max(x) \n * \n * `js` \n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]); \n * \n * const axis = 1; \n * \n * x.max(axis).print(); // or tf.max(x, \n axis) \n * \n * ` ` \n * \n * @param x The input tensor. \n * \n * @param axis The dimension(s) to reduce. By default it \n reduces \n * all dimensions. \n * \n * @param keepDims If true, retains reduced dimensions with size 1. \n * \n * @doc \n {heading: 'Operations', subheading: 'Reduction'} \n\nfunction max_<T extends Tensor>(\n x: \n Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T { \n const $x = convertToTensor(x, 'x', \n 'max'); \n\n const inputs: MaxInputs = {x: $x}; \n const attrs: MaxAttrs = {reductionIndices: axis, keepDims}; \n\n return ENGINE.runKernel(\n Max, inputs as { } as NamedTensorMap, attrs as { } as \n NamedAttrMap); \n } \n\n export const max = op({max_}); \n\n"/** \n * @license \n * Copyright 2020 Google LLC. All \n Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the "License"); \n * you may not use this \n file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n * \n http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or agreed to in writing, \n software \n * distributed under the License is distributed on an "AS IS" BASIS, \n * WITHOUT WARRANTIES \n OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language \n governing permissions and \n * limitations under the License. \n * \n
```

```
===== \n\n*/ \n\nimport {ENGINE} from '../engine'; \nimport {Sub, SubInputs} from '../kernel_names'; \nimport {Tensor} from \n '../tensor'; \nimport {NamedTensorMap} from '../tensor_types'; \nimport {makeTypesMatch} from \n '../tensor_util'; \nimport {convertToTensor} from '../tensor_util_env'; \nimport {TensorLike} from '../types'; \n\nimport {op} from './operation'; \n\n/** \n * Subtracts two `tf.Tensor`s element-wise, A - B. Supports broadcasting. \n * \n * `js` \n * const a = tf.tensor1d([10, 20, 30, 40]); \n * const b = tf.tensor1d([1, 2, 3, 4]); \n * \n * a.sub(b).print(); // or \n tf.sub(a, b) \n * \n * ` ` \n * \n * `js` \n * // Broadcast subtract a with b. \n * const a = tf.tensor1d([10, 20, 30, 40]); \n * const \n b = tf.scalar(5); \n * \n * a.sub(b).print(); // or tf.sub(a, b) \n * \n * ` ` \n * \n * @param a The first `tf.Tensor` to subtract \n from. \n * \n * @param b The second `tf.Tensor` to be subtracted. Must have the same dtype as `a`. \n * \n * @doc \n {heading: 'Operations', subheading: 'Arithmetic'} \n\nfunction sub_<T extends Tensor>(a: Tensor|TensorLike, b: \n Tensor|TensorLike): T { \n let $a = convertToTensor(a, 'a', 'sub'); \n let $b = convertToTensor(b, 'b', 'sub'); \n [$a, \n $b] = makeTypesMatch($a, $b); \n\n const inputs: SubInputs = {a: $a, b: $b}; \n\n return ENGINE.runKernel(Sub, \n inputs as { } as NamedTensorMap); \n } \n\n export const sub = op({sub_}); \n\n"/** \n * @license \n * Copyright 2018 \n Google LLC. All Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the "License"); \n * you \n may not use this file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n * \n http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or agreed to in writing, \n
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software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\nimport {ENGINE} from './engine';\nimport {Sum, SumAttrs, SumInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Computes the sum of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims` is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in `axes`. If `keepDims` is true, the reduced dimensions are retained with length 1. If axes has no entries, all dimensions are reduced, and a `tf.Tensor` with a single element is returned.\n *\n * `js` const x = tf.tensor1d([1, 2, 3]);\n *\n * x.sum().print();\n // or tf.sum(x)\n *\n * `js` const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n *\n * x.sum(axis).print(); // or tf.sum(x, axis)\n *\n * @param x The input tensor to compute the sum over. If the dtype is `bool` it will be converted to `int32` and the output dtype will be `int32`.\n *\n * @param axis The dimension(s) to reduce. By default it reduces all dimensions.\n *\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction sum_<T extends Tensor>(\n x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n let $x = convertToTensor(x, 'x', 'sum');\n if ($x.dtype === 'bool') {\n $x = cast($x, 'int32');\n }\n const inputs: SumInputs = {x: $x};\n const attrs: SumAttrs = {axis, keepDims};\n return ENGINE.runKernel(\n Sum, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const sum = op({sum_});\n\n/**\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n */
```

```
=====\n*\nimport {customGrad} from './gradients';\nimport {Tensor} from './tensor';\nimport {GradSaveFunc} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {cast} from './cast';\nimport {exp} from './exp';\nimport {log} from './log';\nimport {max} from './max';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {sub} from './sub';\nimport {sum} from './sum';\n\n/**\n * Computes the log softmax.\n *\n * `js` const a = tf.tensor1d([1, 2, 3]);\n *\n * a.logSoftmax().print(); // or tf.logSoftmax(a)\n *\n * `js` const a = tf.tensor2d([2, 4, 6, 1, 2, 3], [2, 3]);\n *\n * a.logSoftmax().print(); // or tf.logSoftmax(a)\n *\n * @param logits The logits array.\n *\n * @param axis The dimension softmax would be performed on. Defaults to -1 which indicates the last dimension.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction logSoftmax_<T extends Tensor>(\n logits: T|TensorLike, axis = -1): T {\n const $logits = convertToTensor(logits, 'logits', 'logSoftmax');\n if (axis === -1) {\n axis = $logits.rank - 1;\n }\n if (axis !== $logits.rank - 1) {\n throw Error(\n `Log Softmax along a non-last dimension is not yet supported. ` +\n `Logits was rank ${$logits.rank} and axis was ${axis}`);\n }\n // const forward: ForwardFunc<Tensor> = (backend, save) => {\n // const keepDims = true;\n // const xMax = max(logits, axis, true);\n // const shifted = sub(logits, xMax);\n // const value =\n // sub(cast(shifted, 'float32'), log(sum(exp(shifted), axis, keepDims)));\n // save([value]);\n // return value;\n // };\n // Use a custom gradient for numerical stability.\n const customOp = customGrad((logits: Tensor, save: GradSaveFunc) => {\n const keepDims = true;\n const xMax = max(logits, axis, true);\n const shifted = sub(logits, xMax);\n const value =\n sub(cast(shifted, 'float32'), log(sum(exp(shifted), axis, keepDims)));\n save([value]);\n const gradFunc = (dy: Tensor, saved: Tensor[]) => {\n const [value] = saved;\n const keepDims = true;\n const softmax = exp(value);\n return sub(dy, mul(sum(dy, axis, keepDims), softmax));\n };\n });\n}
```

```
};\n return {value, gradFunc};\n });\n\n return customOp($logits) as T;\n\n // TODO Use Engine.runKernel
when CPU/WebGL/WASM backends implement this.\n // const inputs: LogSoftmaxInputs = {logits: $logits};\n //
const attrs: LogSoftmaxAttrs = {axis};\n // return ENGINE.runKernel(\n // LogSoftmax, inputs as {} as
NamedTensorMap,\n // attrs as {} as NamedAttrMap);\n}\n\n\nexport const logSoftmax =
op({logSoftmax_});\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

```
=====\n
*\n\nimport * as util from './util';\n\n/**\n * Returns true if the axis specifies the inner most dimensions of the\n *
array.\n *\nexport function axesAreInnerMostDims(axes: number[], rank: number): boolean {\n for (let i = 0; i <
axes.length; ++i) {\n if (axes[axes.length - i - 1] !== rank - 1 - i) {\n return false;\n } }\n return
true;\n}\n\nexport function combineLocations(\n outputLoc: number[], reduceLoc: number[], axes: number[]):
number[] {\n const rank = outputLoc.length + reduceLoc.length;\n const loc = [];\n let outIdx = 0;\n let reduceIdx
= 0;\n for (let dim = 0; dim < rank; dim++) {\n if (axes.indexOf(dim) === -1) {\n
loc.push(outputLoc[outIdx++]);\n } else {\n loc.push(reduceLoc[reduceIdx++]);\n } }\n return
loc;\n}\n\nexport function computeOutAndReduceShapes(\n aShape: number[], axes: number[]): [number[],
number[]] {\n const outShape = [];\n const rank = aShape.length;\n for (let dim = 0; dim < rank; dim++) {\n if
(axes.indexOf(dim) === -1) {\n outShape.push(aShape[dim]);\n } }\n const reduceShape = axes.map(dim
=> aShape[dim]);\n return [outShape, reduceShape];\n}\n\nexport function expandShapeToKeepDim(\n shape:
number[], axes: number[]): number[] {\n const reduceSubShape = axes.map(x => 1);\n return
combineLocations(shape, reduceSubShape, axes);\n}\n\nexport function assertAxesAreInnerMostDims(\n msg:
string, axes: number[], rank: number): void {\n util.assert(\n axesAreInnerMostDims(axes, rank),\n () =>
`$ {msg} supports only inner-most axes for now. ` +\n `Got axes $ {axes} and rank-$ {rank}
input.`);\n}\n\n/**\n * Returns the axes permutation to be used with `tf.transpose`, if such\n * permutation is
necessary. Otherwise it returns null. This method is used by\n * operations that operate only on inner-most axes.\n *\nexport function getAxesPermutation(axes: number[], rank: number): number[]\n null {\n if
(axesAreInnerMostDims(axes, rank)) {\n return null;\n }\n const result: number[] = [];\n for (let i = 0; i < rank;
++i) {\n if (axes.indexOf(i) === -1) {\n result.push(i);\n } }\n axes.forEach(axis => result.push(axis));\n
return result;\n}\n\n/**\n * Returns the axes permutation that undoes the original permutation. *\nexport function
getUndoAxesPermutation(axes: number[]): number[] {\n return axes.map((axis, i) => [i, axis]).sort((a, b) =>
a[1] - b[1]).map(x => x[0]);\n}\n\nexport function getInnerMostAxes(numAxes: number, rank: number):
number[] {\n const res: number[] = [];\n for (let i = rank - numAxes; i < rank; ++i) {\n res.push(i);\n } }\n
return
res;\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}
from './types';\nimport {parseAxisParam} from './util';\n\nimport {add} from './add';\nimport
{expandShapeToKeepDim} from './axis_util';\nimport {exp} from './exp';\nimport {log} from './log';\nimport {max}
from './max';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {sub} from
'/sub';\nimport {sum} from './sum';\n\n/**\n * Computes the log(sum(exp(elements across the reduction
```

```

dimensions)).\n *\n * Reduces the input along the dimensions given in `axis`. Unless `keepDims`\n * is true, the
rank of the array is reduced by 1 for each entry in `axis`.\n *\n * If `keepDims` is true, the reduced dimensions are
retained with length 1.\n *\n * If `axis` has no entries, all dimensions are reduced, and an array with a\n * single element
is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.logSumExp().print(); // or tf.logSumExp(x)\n *
```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const axis = 1;\n * x.logSumExp(axis).print(); //
or tf.logSumExp(a, axis)\n * ```\n * @param x The input tensor.\n * @param axis The dimension(s) to reduce. If
null (the default),\n * reduces all dimensions.\n * @param keepDims If true, retains reduced dimensions with
length\n * of 1. Defaults to false.\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction
logSumExp<T extends Tensor>(\n x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n
const $x = convertToTensor(x, 'x', 'logSumExp');\n\n const axes = parseAxisParam(axis, $x.shape);\n const xMax
= max($x, axes, true /* keepDims */);\n const a = sub($x, xMax);\n const b = exp(a);\n const c = sum(b, axes);\n
const d = log(c);\n const res = add(reshape(xMax, d.shape), d);\n\n if (keepDims) {\n const newShape =
expandShapeToKeepDim(res.shape, axes);\n return reshape(res, newShape) as T;\n }\n\n return res as
T;\n}\n\nexport const logSumExp = op({logSumExp_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {ENGINE} from '../engine';\nimport {LogicalAnd, LogicalAndInputs} from '../kernel_names';\nimport
{Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assertAndGetBroadcastShape} from
'../broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of `a AND b` element-wise.
Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b =
tf.tensor1d([false, true, false, true], 'bool');\n * a.logicalAnd(b).print();\n * ```\n *\n * @param a The first input
tensor. Must be of dtype bool.\n * @param b The second input tensor. Must be of dtype bool.\n *\n * @doc
{heading: 'Operations', subheading: 'Logical'}\n */\nfunction logicalAnd<T extends Tensor>(\n a:
Tensor|TensorLike, b: Tensor|TensorLike): T {\n const $a = convertToTensor(a, 'a', 'logicalAnd', 'bool');\n const $b
= convertToTensor(b, 'b', 'logicalAnd', 'bool');\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const
inputs: LogicalAndInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(LogicalAnd, inputs as { } as
NamedTensorMap);\n}\n\nexport const logicalAnd = op({logicalAnd_});\n"/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*\nimport {ENGINE} from '../engine';\nimport {LogicalNot, LogicalNotInputs} from '../kernel_names';\nimport
{Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n/**\n * Returns the
truth value of `NOT x` element-wise.\n *\n * ```js\n * const a = tf.tensor1d([false, true], 'bool');\n *
a.logicalNot().print();\n * ```\n *\n * @param x The input tensor. Must be of dtype 'bool'. \n *\n * @doc {heading:
'Operations', subheading: 'Logical'}\n */\nfunction logicalNot<T extends Tensor>(x: T|TensorLike): T {\n const
$x = convertToTensor(x, 'x', 'logicalNot', 'bool');\n const inputs: LogicalNotInputs = {x: $x};\n return
ENGINE.runKernel(LogicalNot, inputs as { } as NamedTensorMap);\n}\n\nexport const logicalNot =

```

op({logicalNot_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {LogicalOr, LogicalOrInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/*\n * Returns the truth value of `a OR b` element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b = tf.tensor1d([false, true, false, true], 'bool');\n * a.logicalOr(b).print();\n * ```\n *\n * @param a The first input tensor. Must be of dtype bool.\n * @param b The second input tensor. Must be of dtype bool.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction logicalOr_<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  const $a = convertToTensor(a, 'a', 'logicalOr', 'bool');\n  const $b = convertToTensor(b, 'b', 'logicalOr', 'bool');\n  assertAndGetBroadcastShape($a.shape, $b.shape);\n\n  const inputs: LogicalOrInputs = {a: $a, b: $b};\n  return ENGINE.runKernel(LogicalOr, inputs as { } as NamedTensorMap);\n}\n\nexport const logicalOr = op({logicalOr_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {logicalAnd} from './logical_and';\nimport {logicalNot} from './logical_not';\nimport {logicalOr} from './logical_or';\nimport {op} from './operation';\n\n/*\n * Returns the truth value of `a XOR b` element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b = tf.tensor1d([false, true, false, true], 'bool');\n * a.logicalXor(b).print();\n * ```\n *\n * @param a The first input tensor. Must be of dtype bool.\n * @param b The second input tensor. Must be of dtype bool.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction logicalXor_<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  const $a = convertToTensor(a, 'a', 'logicalXor', 'bool');\n  const $b = convertToTensor(b, 'b', 'logicalXor', 'bool');\n  assertAndGetBroadcastShape($a.shape, $b.shape);\n\n  // x ^ y = (x | y) & ~(x & y)\n  return logicalAnd(logicalOr(a, b), logicalNot(logicalAnd(a, b)));\n}\n\nexport const logicalXor = op({logicalXor_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {MaxPool, MaxPoolAttrs, MaxPoolInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from
```



```

'./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
'./tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport * as conv_util
from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 2D
max pooling of an image.\n * @param x The input tensor, of rank 4 or rank 3 of shape\n *   `[batch, height,
width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param filterSize The filter size: `[filterHeight,
filterWidth]`. If\n *   `filterSize` is a single number, then `filterHeight == filterWidth`.\n * @param strides The
strides of the pooling: `[strideHeight, strideWidth]`. If\n *   `strides` is a single number, then `strideHeight ==
strideWidth`.\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n *   in which we sample
input values across the height and width dimensions\n *   in dilated pooling. Defaults to `[1, 1]`. If `dilations` is a
single\n *   number, then `dilationHeight == dilationWidth`. If it is greater than\n *   1, then all values of `strides`
must be 1.\n * @param pad The type of padding algorithm.\n *   - `same` and stride 1: output will be of same size
as input,\n *   regardless of filter size.\n *   - `valid`: output will be smaller than input if filter is larger\n *
than 1x1.\n *   - For more info, see this guide:\n *
[https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from:
'ceil', 'round', 'floor'. If none is\n *   provided, it will default to truncate.\n */\nfunction maxPool<T extends
Tensor3D|Tensor4D>(\n  x: T|TensorLike, filterSize: [number, number]|number,\n  strides: [number,
number]|number, pad: 'valid'|'same'|number,\n  dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n  const $x =
convertToTensor(x, 'x', 'maxPool');\n  const dilations = 1;\n  let x4D = $x as Tensor4D;\n  let reshapedTo4D =
false;\n  if ($x.rank === 3) {\n    reshapedTo4D = true;\n    x4D = reshape($x, [1, $x.shape[0], $x.shape[1],
$x.shape[2]]);\n  }\n  util.assert(\n    x4D.rank === 4,\n    () => `Error in maxPool: input must be rank 4 but got
rank ${x4D.rank}.`);\n  util.assert(\n    conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n    () =>
`Error in maxPool: Either strides or dilations must be 1.` +\n    `Got strides ${strides} and dilations
${dilations}`);\n  if (dimRoundingMode != null) {\n    util.assert(\n      util.isInt(pad as number),\n      () =>
`Error in maxPool: pad must be an integer when using, ` +\n      `dimRoundingMode ${dimRoundingMode} but
got pad ${pad}.`);\n  }\n  const inputs: MaxPoolInputs = {x: x4D};\n  const attrs: MaxPoolAttrs = {filterSize,
strides, pad, dimRoundingMode};\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  const res =
ENGINE.runKernel(\n    MaxPool, inputs as {} as NamedTensorMap,\n    attrs as {} as
NamedAttrMap) as T;\n  if (reshapedTo4D) {\n    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as
T;\n  }\n  return res;\n}\n\nexport const maxPool = op({maxPool_});\n\n/**\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\nimport {ENGINE} from './engine';\nimport {MaxPool3D, MaxPool3DAttrs, MaxPool3DInputs} from
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor4D, Tensor5D} from
'./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
'./tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {op} from
'./operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 3D max pooling.\n * @param x The input
tensor, of rank 5 or rank 4 of shape\n *   `[batch, depth, height, width, inChannels]`.\n * @param filterSize The
filter size:\n *   `[filterDepth, filterHeight, filterWidth]`. If\n *   `filterSize` is a single number,\n *   then
`filterDepth == filterHeight == filterWidth`.\n * @param strides The
strides of the pooling:\n *   `[strideDepth, strideHeight, strideWidth]`. If `strides` is a single number,\n *
then `strideDepth == strideHeight == strideWidth`.\n * @param pad The type of padding algorithm.\n *   - `same`

```

and stride 1: output will be of same size as input, regardless of filter size. - `valid`: output will be smaller than input if filter is larger than 1x1x1. - For more info, see this guide: https://www.tensorflow.org/api_guides/python/nn#Convolution

`https://www.tensorflow.org/api_guides/python/nn#Convolution`

@param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is provided, it will default to truncate.

@param dataFormat An optional string from: "NDHWC", "NCDHW". Defaults to "NDHWC". Specify the data format of the input and output data. With the default format "NDHWC", the data is stored in the order of: [batch, depth, height, width, channels]. Only "NDHWC" is currently supported.

@doc {heading: 'Operations', subheading: 'Convolution'}
`function maxPool3d_<T extends Tensor4D|Tensor5D>(x: T|TensorLike, filterSize: [number, number, number], number = [1, 1, 1], strides: [number, number, number], number, pad: 'valid'|'same'|number, dimRoundingMode?: 'floor'|'round'|'ceil', dataFormat: 'NDHWC'|'NCDHW' = 'NDHWC'): T {
 const $x = convertToTensor(x, 'x', 'maxPool3d');
 let x5D = $x as Tensor5D;
 let reshapedTo5D = false;
 if ($x.rank === 4) {
 reshapedTo5D = true;
 x5D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2], $x.shape[3]]);
 }
 util.assert(x5D.rank === 5, () => `Error in maxPool3d: x must be rank 5 but got rank ${x5D.rank}.`);
 util.assert(dataFormat === 'NDHWC', () => `Error in maxPool3d: Only NDHWC is currently supported, ` + `but got dataFormat of ${dataFormat}`);
 if (dimRoundingMode != null) {
 util.assert(util.isInt(pad as number), () => `Error in maxPool3d: pad must be an integer when using, ` + `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);
 }
 const inputs: MaxPool3DInputs = {x: x5D};
 const attrs: MaxPool3DAttrs = {filterSize, strides, pad, dimRoundingMode, dataFormat};
 // tslint:disable-next-line: no-unnecessary-type-assertion
 const res = ENGINE.runKernel(MaxPool3D, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap) as T;
 if (reshapedTo5D) {
 return reshape(res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]] as T);
 }
 return res;
}`

`export const maxPool3d = op({maxPool3d_});`

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====

```

import {ENGINE} from '../engine';
import {MaxPoolWithArgmax, MaxPoolWithArgmaxAttrs, MaxPoolWithArgmaxInputs} from './kernel_names';
import {NamedAttrMap} from './kernel_registry';
import {Tensor, Tensor4D} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';

/** Computes the 2D max pooling of an image with Argmax index. The indices in argmax are flattened, so that a maximum value at position [b, y, x, c] becomes flattened index: (y * width + x) * channels + c if include_batch_in_index is False; ((b * height + y) * width + x) * channels + c if include_batch_in_index is True. The indices returned are always in [0, height) x [0, width) before flattening.
  @param x The input tensor, of rank 4 or rank 3 of shape [batch, height, width, inChannels]. If rank 3, batch of 1 is assumed.
  @param filterSize The filter size: [filterHeight, filterWidth]. If filterSize is a single number, then filterHeight == filterWidth.
  @param strides The strides of the pooling: [strideHeight, strideWidth]. If strides is a single number, then strideHeight == strideWidth.
  @param dataFormat An optional string from: "NDHWC", "NCDHW". Defaults to "NDHWC". Specify the data format of the input and output data. With the default format "NDHWC", the data is stored in the order of: [batch, depth, height, width, channels]. Only "NDHWC" is currently supported.
  @param pad The type of padding algorithm. - `same` and stride 1: output will be of same size as input, regardless of filter size. - `valid`: output will be smaller than input if filter is larger than 1x1. - For more info,

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see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param includeBatchIndex Defaults to False.
Whether to include batch\n * dimension in flattened index of argmax.\n * \n * @doc {heading: 'Operations',
subheading: 'Convolution'}\n * \nfunction maxPoolWithArgmax_<T extends Tensor4D>(\n x: T|TensorLike,
filterSize: [number, number]|number,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n
includeBatchInIndex = false): NamedTensorMap {\n const $x = convertToTensor(x, 'x',
'maxPoolWithArgmax');\n\n const inputs: MaxPoolWithArgmaxInputs = {x: $x};\n const attrs:\n
MaxPoolWithArgmaxAttrs = {filterSize, strides, pad, includeBatchInIndex};\n\n // tslint:disable-next-line: no-
unnecessary-type-assertion\n const result = ENGINE.runKernel(\n
MaxPoolWithArgmax, inputs as { }
as NamedTensorMap,\n attrs as { } as NamedAttrMap) as Tensor[];\n\n return {result: result[0],
indexes: result[1]};\n}\n\nexport const maxPoolWithArgmax = op({maxPoolWithArgmax_});\n", "/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Maximum, MaximumInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
'./tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
{assertAndGetBroadcastShape} from './broadcast_util';\nimport {cast} from './cast';\nimport {op} from
'./operation';\n\n/*\n * Returns the max of a and b (a > b ? a : b) element-wise.\n * Supports broadcasting.\n * \n *
We also expose `tf.maximumStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the
same shape (does not broadcast).\n * \n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2,
9, 4]);\n * a.maximum(b).print(); // or tf.maximum(a, b)\n * \n * ```\n * \n * // Broadcast maximum a with
b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n * a.maximum(b).print(); // or tf.maximum(a,
b)\n * \n * \n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n * \n
* \n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n * \nfunction maximum_<T extends Tensor>(\n a:
Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'maximum');\n let $b =
convertToTensor(b, 'b', 'maximum');\n [$a, $b] = makeTypesMatch($a, $b);\n\n if ($a.dtype === 'bool') {\n $a =
cast($a, 'int32');\n $b = cast($b, 'int32');\n }\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const
inputs: MaximumInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Maximum, inputs as { } as
NamedTensorMap);\n}\n\nexport const maximum = op({maximum_});\n", "/*\n *
@license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Mean, MeanAttrs, MeanInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
'./tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
'./types';\n\nimport {op} from './operation';\n\n/*\n * Computes the mean of elements across dimensions of a
`tf.Tensor`.\n * \n * Reduces `x` along the dimensions given in `axis`. Unless `keepDims` is\n * true, the rank of the
`tf.Tensor` is reduced by 1 for each entry in `axis`.\n * \n * If `keepDims` is true, the reduced dimensions are retained
with length 1.\n * \n * If `axis` has no entries, all dimensions are reduced, and a `tf.Tensor` with\n * a single element is

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returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.mean().print(); // or tf.mean(a)\n *\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n *\n * x.mean(axis).print(); // or tf.mean(x,\n * axis)\n *\n * ```\n *\n * @param x The input tensor.\n * @param axis The dimension(s) to reduce. By default it reduces\n * all dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n *\n * \nfunction mean_<T extends Tensor>(\n * x:\n * Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n * const $x = convertToTensor(x, 'x',\n * 'mean');\n *\n * const inputs: MeanInputs = {x: $x};\n * const attrs: MeanAttrs = {axis, keepDims};\n *\n * return\n * ENGINE.runKernel(\n * Mean, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n *}\n *\n * \nexport\n * const mean = op({mean_});\n *", "/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

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=====\n *\n * \nimport {ENGINE} from './engine';\n * \nimport {Min, MinAttrs, MinInputs} from './kernel_names';\n * \nimport\n * {NamedAttrMap} from './kernel_registry';\n * \nimport {Tensor} from './tensor';\n * \nimport {NamedTensorMap} from\n * './tensor_types';\n * \nimport {convertToTensor} from './tensor_util_env';\n * \nimport {TensorLike} from\n * './types';\n * \nimport {op} from './operation';\n *\n * \n/**\n * Computes the minimum value from the input.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the array is reduced by 1 for each entry in `axes`.\n * If `keepDims` is true, the reduced dimensions are retained with length 1.\n *\n * If `axes` has no entries, all dimensions are reduced, and an array with a\n * single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.min().print(); // or tf.min(x)\n *\n * ```\n *\n * ```js\n * const x =\n * tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n *\n * x.min(axis).print(); // or tf.min(x, axis)\n *\n * ```\n *\n * @param x The input Tensor.\n * @param axis The dimension(s) to reduce. By default it reduces\n * all\n * dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading:\n * 'Operations', subheading: 'Reduction'}\n *\n * \nfunction min_<T extends Tensor>(\n * x: Tensor|TensorLike, axis:\n * number|number[] = null, keepDims = false): T {\n * const $x = convertToTensor(x, 'x', 'min');\n *\n * const inputs:\n * MinInputs = {x: $x};\n * const attrs: MinAttrs = {axis, keepDims};\n *\n * // tslint:disable-next-line: no-unnecessary-\n * type-assertion\n * return ENGINE.runKernel(\n * Min, inputs as {} as NamedTensorMap,\n * attrs as {\n * as NamedAttrMap} as T;\n *}\n *\n * \nexport const min = op({min_});\n *", "/**\n * @license\n * Copyright 2020 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n *\n * \nimport {ENGINE} from './engine';\n * \nimport {Minimum, MinimumInputs} from './kernel_names';\n * \nimport\n * {Tensor} from './tensor';\n * \nimport {NamedTensorMap} from './tensor_types';\n * \nimport {makeTypesMatch} from\n * './tensor_util';\n * \nimport {convertToTensor} from './tensor_util_env';\n * \nimport {TensorLike} from './types';\n * \nimport\n * {assertAndGetBroadcastShape} from './broadcast_util';\n * \nimport {cast} from './cast';\n * \nimport {op} from\n * './operation';\n *\n * \n/**\n * Returns the min of a and b ( $a < b ? a : b$ ) element-wise.\n * Supports broadcasting.\n *\n * We also expose `minimumStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the\n * same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2,\n * 9, 4]);\n *\n * a.minimum(b).print(); // or tf.minimum(a, b)\n *\n * ```\n *\n * ```js\n * // Broadcast minimum a with\n * b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n *\n * a.minimum(b).print(); // or tf.minimum(a,
```

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b)\n * ```\n * \n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n * \n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction minimum_<T extends Tensor>(\n  a:\n  Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let $a = convertToTensor(a, 'a', 'minimum');\n  let $b =\n  convertToTensor(b, 'b', 'minimum');\n  [$a, $b] = makeTypesMatch($a, $b);\n  \n  if ($a.dtype === 'bool') {\n    $a =\n    cast($a, 'int32');\n    $b = cast($b, 'int32');\n  }\n  \n  assertAndGetBroadcastShape($a.shape, $b.shape);\n  \n  const\n  inputs: MinimumInputs = {a: $a, b: $b};\n  \n  return ENGINE.runKernel(Minimum, inputs as { } as\n  NamedTensorMap);\n  \n}\n\nexport const minimum = op({minimum_});\n", "/*\n * @license\n * Copyright 2020\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {ENGINE} from './engine';\nimport {MirrorPad, MirrorPadAttrs, MirrorPadInputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport\n {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport\n {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Pads a\n * `tf.Tensor` using mirror padding.\n * \n * This operation implements the `REFLECT` and `SYMMETRIC` modes of\n * pad.\n * \n * ```\n * const x = tf.range(0, 9).reshape([1, 1, 3, 3]);\n * x.mirrorPad([[0, 0], [0, 0], [2, 2], [2, 2]],\n * 'reflect').print();\n * ```\n * \n * @param x The tensor to pad.\n * \n * @param paddings An array of length `R` (the rank of\n * the tensor), where\n * each element is a length-2 tuple of ints `[padBefore, padAfter]`,\n * specifying how much to\n * pad along each dimension of the tensor.\n * \n * In "reflect" mode, the padded regions do not include the borders,\n * while in "symmetric" mode the padded regions do include the borders.\n * For example, if the input is `[1, 2, 3]`\n * and paddings is `[0, 2]`,\n * then the output is `[1, 2, 3, 2, 1]` in "reflect" mode, and\n * `[1, 2, 3, 3, 2]` in\n * "symmetric" mode.\n * \n * If `mode` is "reflect" then both `paddings[D, 0]` and `paddings[D, 1]`\n * must be no\n * greater than `x.shape[D] - 1`. If mode is "symmetric" then both `paddings[D, 0]` and `paddings[D, 1]`\n * must be\n * no greater than\n * `x.shape[D]`\n * \n * @param mode String to specify padding mode. Can be `reflect` | `symmetric`\n */\n/**\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction mirrorPad_<T extends Tensor>(\n  x: T|TensorLike, paddings: Array<number, number>,\n  mode: 'reflect'|'symmetric'): T {\n  util.assert(\n    mode\n    === 'reflect' || mode === 'symmetric',\n    () => `Invalid mode. Mode must be either reflect or symmetric.` +\n    `Got ${mode}.`);\n  \n  const $x = convertToTensor(x, 'x', 'mirrorPad');\n  if ($x.rank === 0) {\n    throw new Error(\n      'mirrorPad(scalar) is not defined. ' +\n      `Pass non-scalar to mirrorPad`);\n  }\n  \n  util.assert(\n    paddings.length === $x.rank,\n    () => `Padding doesn't match input. Must be ${$x.rank}.` +\n    `Got\n    ${paddings.length}.`);\n  \n  const shapeOffset = mode === 'reflect' ? 1 : 0;\n  for (let i = 0; i < $x.rank; i++) {\n    util.assert(\n      paddings[i].length === 2,\n      () => `Invalid number of paddings. Must be length of 2 each.`);\n    \n    util.assert(\n      paddings[i][0] >= 0 && paddings[i][0] <= $x.shape[i] - shapeOffset &&\n      paddings[i][1]\n      >= 0 && paddings[i][1] <= $x.shape[i] - shapeOffset,\n      () => `Padding in dimension ${i} cannot be greater\n      than or equal ` +\n      `to ${$x.shape[i] - shapeOffset} or less than 0 for input of ` +\n      `shape\n      ${$x.shape}`);\n  }\n  \n  const attrs: MirrorPadAttrs = {paddings, mode};\n  const inputs: MirrorPadInputs = {x:\n  $x};\n  \n  return ENGINE.runKernel(\n    MirrorPad, inputs as { } as NamedTensorMap, attrs as { } as\n    NamedAttrMap);\n  \n}\n\nexport const mirrorPad = op({mirrorPad_});\n", "/*\n * @license\n * Copyright 2020\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {ENGINE} from './engine';\nimport {Mod, ModInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
 {op} from './operation';\n\n/**\n * Returns the mod of a and b element-wise.\n * `floor(x / y) * y + mod(x, y) = x`\n
 * Supports broadcasting.\n *\n * We also expose `tf.modStrict` which has the same signature as this op and\n *
 asserts that `a` and `b` are the same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n
 * const b = tf.tensor1d([1, 2, 9, 4]);\n *\n * a.mod(b).print(); // or tf.mod(a, b)\n *\n * ```\n *\n * // Broadcast a
 mod b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n *\n * a.mod(b).print(); // or tf.mod(a, b)\n
 * ```\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n *\n *
 @doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction mod_<T extends Tensor>(a:
 Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let $a = convertToTensor(a, 'a', 'mod');\n  let $b =
 convertToTensor(b, 'b', 'mod');\n  [$a, $b] = makeTypesMatch($a, $b);\n\n  const inputs: ModInputs = {a: $a, b:
 $b};\n\n  return ENGINE.runKernel(Mod, inputs as {} as NamedTensorMap);\n}\n\nexport const mod =
 op({mod_});\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
 Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
 Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *

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=====
*\n\nimport {ENGINE} from './engine';\nimport {Tensor} from './tensor';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
 square of `x` element-wise: `x ^ 2`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, Math.sqrt(2), -1]);\n *\n *
 x.square().print(); // or tf.square(x)\n *\n * ```\n *\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations',
 subheading: 'Basic math'}\n *\nfunction square_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =
 convertToTensor(x, 'x', 'square');\n  const attrs = {};\n  return ENGINE.runKernel('Square', {x: $x,
 attrs});\n}\n\nexport const square = op({square_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
 Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
 except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}
from './types';\nimport {parseAxisParam} from './util';\n\nimport {expandShapeToKeepDim} from
 './axis_util';\nimport {cast} from './cast';\nimport {mean} from './mean';\nimport {op} from './operation';\nimport
 {reshape} from './reshape';\nimport {square} from './square';\nimport {sub} from './sub';\n\n/**\n * Calculates the
 mean and variance of `x`. The mean and variance are\n * calculated by aggregating the contents of `x` across `axes`.
 If `x` is\n * 1-D and `axes = [0]` this is just the mean and variance of a vector.\n *\n * @param x The input tensor.\n
 *\n * @param axis The dimension(s) along with to compute mean and\n * variance. By default it reduces all
 dimensions.\n * @param keepDims If true, the moments have the same dimensionality as the\n * input.\n *
 @return An object with two keys: `mean` and `variance`.\n *\n * @doc {heading: 'Operations', subheading:
 'Normalization'}\n *\nfunction moments_<\n  x: Tensor|TensorLike, axis: number|number[] = null,\n  keepDims
 = false>: {mean: Tensor, variance: Tensor} {\n  x = convertToTensor(x, 'x', 'moments');\n  const axes =
 parseAxisParam(axis, x.shape);\n  const xMean = mean(x, axes, keepDims);\n  let keepDimsShape =

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xMean.shape;\n if (!keepDims) {\n   keepDimsShape = expandShapeToKeepDim(xMean.shape, axes);\n }\n const devSquared =\n   square(sub(cast(x, 'float32'), reshape(xMean, keepDimsShape)));\n const variance =\n   mean(devSquared, axes, keepDims);\n return {mean: xMean, variance};\n}\n\nexport const moments =\n  op({moments_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
=====
*\nimport {Tensor2D} from './tensor';\nimport {convertToTensor, convertToTensorArray} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * @docalias\n (data: Tensor2D, c: Tensor2D, h: Tensor2D): [Tensor2D, Tensor2D]\n *\nexport type LSTMCellFunc = {\n (data:\n Tensor2D, c: Tensor2D, h: Tensor2D): [Tensor2D, Tensor2D];\n};\n\n/**\n * Computes the next states and outputs\n of a stack of LSTMCells.\n *\n * Each cell output is used as input to the next cell.\n *\n * Returns `[cellState,\n cellOutput]`.\n *\n * Derived from tf.contrib.rnn.MultiRNNCell.\n *\n * @param lstmCells Array of LSTMCell\n functions.\n * @param data The input to the cell.\n * @param c Array of previous cell states.\n * @param h Array\n of previous cell outputs.\n *\n * @doc {heading: 'Operations', subheading: 'RNN'}\n *\nfunction multiRNNCell_(\n  lstmCells: LSTMCellFunc[], data: Tensor2D|TensorLike,\n  c: Array<Tensor2D|TensorLike>,\n  h:\n Array<Tensor2D|TensorLike>): [Tensor2D[], Tensor2D[]] {\n  const $data = convertToTensor(data, 'data',\n 'multiRNNCell');\n  const $c = convertToTensorArray(c, 'c', 'multiRNNCell');\n  const $h =\n convertToTensorArray(h, 'h', 'multiRNNCell');\n\n  let input = $data;\n  const newStates = [];\n  for (let i = 0; i <\n lstmCells.length; i++) {\n    const output = lstmCells[i](input, $c[i], $h[i]);\n    newStates.push(output[0]);\n    newStates.push(output[1]);\n    input = output[1];\n  }\n  const newC: Tensor2D[] = [];\n  const newH: Tensor2D[] =\n [];\n  for (let i = 0; i < newStates.length; i += 2) {\n    newC.push(newStates[i]);\n    newH.push(newStates[i + 1]);\n  }\n  return [newC, newH];\n}\n\nexport const multiRNNCell = op({multiRNNCell_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {ENGINE} from './engine';\nimport {Multinomial, MultinomialAttrs, MultinomialInputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor1D, Tensor2D} from\n './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\nimport {reshape} from\n './reshape';\n\n/**\n * Creates a `tf.Tensor` with values drawn from a multinomial distribution.\n *\n * ```\n * const\n probs = tf.tensor([.75, .25]);\n * tf.multinomial(probs, 3).print();\n * ```\n *\n * @param logits 1D array with\n unnormalized log-probabilities, or\n * 2D array of shape `[batchSize, numOutcomes]`. See the `normalized`\n * parameter.\n * @param numSamples Number of samples to draw for each row slice.\n * @param seed The seed\n number.\n * @param normalized Whether the provided `logits` are normalized true\n * probabilities (sum to 1).\n Defaults to false.\n * @return 1D array of shape `[numSamples]`, or 2D array of shape\n * `[batchSize,\n numSamples]`, depending on the rank of the input.\n *\n * @doc {heading: 'Tensors', subheading: 'Random'}\n *\nfunction multinomial_(\n  logits: Tensor1D|Tensor2D|TensorLike, numSamples: number, seed?: number,\n normalized = false): Tensor1D|Tensor2D {\n  const $logits = convertToTensor(logits, 'logits', 'multinomial');\n  const numOutcomes = $logits.size;\n  const origRank = $logits.rank;\n  if (numOutcomes < 2) {\n    throw new

```

```

Error(\n      `Error in multinomial: you need at least 2 outcomes, but got ` +\n      `${numOutcomes}.`);\n }\n if
(origRank > 2) {\n  throw new Error(`Rank of probabilities must be 1 or 2, but is ${origRank}`);\n }\n //
TODO(lina128): Investigate correct seed behavior. The code seems not allow\n // setting see to 0.\n seed = seed ||
Math.random();\n\n // The kernel only accepts (and returns) rank 2 tensors.\n const logits2D: Tensor2D =\n origRank === 1 ? reshape($logits, [1, -1]) : $logits as Tensor2D;\n\n const inputs: MultinomialInputs = {logits:
logits2D};\n const attrs: MultinomialAttrs = {numSamples, seed, normalized};\n\n // tslint:disable-next-line: no-
unnecessary-type-assertion\n const res = ENGINE.runKernel(\n      Multinomial, inputs as {} as
NamedTensorMap,\n      attrs as {} as NamedAttrMap) as Tensor2D;\n\n // tslint:disable-next-line:no-
unnecessary-type-assertion\n return origRank === 1 ? reshape(res, [res.size]) as Tensor1D : res;\n}\n\nexport const
multinomial = op({multinomial_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n
*\nimport {ENGINE} from '../engine';\nimport {NotEqual, NotEqualInputs} from '../kernel_names';\nimport
{Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from
 '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport
{assertAndGetBroadcastShape} from '../broadcast_util';\nimport {op} from './operation';\n\n**\n * Returns the truth
value of (a != b) element-wise. Supports broadcasting.\n *\n * ``js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b =
tf.tensor1d([0, 2, 3]);\n * a.notEqual(b).print();\n * ``\n * @param a The first input tensor.\n * @param b The
second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n
*\nfunction notEqual<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let $a =
convertToTensor(a, 'a', 'notEqual');\n  let $b = convertToTensor(b, 'b', 'notEqual');\n  [$a, $b] =
makeTypesMatch($a, $b);\n\n  assertAndGetBroadcastShape($a.shape, $b.shape);\n\n  const inputs: NotEqualInputs
= {a: $a, b: $b};\n\n  return ENGINE.runKernel(NotEqual, inputs as {} as NamedTensorMap);\n}\n\nexport const
notEqual = op({notEqual_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n
*\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap}
from '../types';\nimport {makeZerosTypedArray, sizeFromShape} from '../util';\nimport {complex} from
 '../complex';\n\n**\n * Creates a `tf.Tensor` with all elements set to 0.\n *\n * ``js\n * tf.zeros([2, 2]).print();\n *
``\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param dtype The type of an
element in the resulting tensor. Can\n *   be 'float32', 'int32' or 'bool'. Defaults to 'float'. \n *\n * @doc {heading:
'Tensors', subheading: 'Creation'}\n *\nfunction zeros<R extends Rank>(\n  shape: ShapeMap[R], dtype:
DataType = 'float32'): Tensor<R> {\n  if (dtype === 'complex64') {\n    const real = zeros(shape, 'float32');\n    const
imag = zeros(shape, 'float32');\n    return complex(real, imag);\n  }\n  const values =
makeZerosTypedArray(sizeFromShape(shape), dtype);\n  return ENGINE.makeTensor(values, shape, dtype) as
Tensor<R>;\n}\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n *

```


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```
=====
*import {ENGINE} from '../engine';import {Tensor} from '../tensor';import {DataType, Rank, ShapeMap}
from '../types';import {makeOnesTypedArray, sizeFromShape} from './util';import {complex} from
'./complex';import {zeros} from './zeros';
/** Creates a `tf.Tensor` with all elements set to 1.
 * @param shape An array of integers defining the output tensor shape.
 * @param dtype The type of an element in the resulting tensor. Defaults to `float`.
 * @doc {heading: 'Tensors', subheading: 'Creation'}
*/export function ones<R extends Rank>(shape: ShapeMap[R], dtype:
DataType = 'float32'): Tensor<R> {
  if (dtype === 'complex64') {
    const real = ones(shape, 'float32');
    const imag = zeros(shape, 'float32');
    return complex(real, imag);
  }
  const values =
makeOnesTypedArray(sizeFromShape(shape), dtype);
  return ENGINE.makeTensor(values, shape, dtype) as
Tensor<R>;
}
"/**
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 *
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on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.
 * See the License for the specific language governing permissions and
limitations under the
License.
 *
=====
```

```
=====
*import {ENGINE} from '../engine';import {OnesLike, OnesLikeInputs} from './kernel_names';import
{Tensor} from '../tensor';import {NamedTensorMap} from './tensor_types';import {convertToTensor} from
'./tensor_util_env';import {TensorLike} from '../types';import {op} from './operation';
/** Creates a
`tf.Tensor` with all elements set to 1 with the same shape as the
given tensor.
 * @param x A tensor.
 * @doc {heading: 'Tensors',
subheading: 'Creation'}
*/function onesLike_<T extends Tensor>(x: T|TensorLike): T {
  const $x =
convertToTensor(x, 'x', 'onesLike');
  const inputs: OnesLikeInputs = {x: $x};
  return
ENGINE.runKernel(OnesLike, inputs as { } as NamedTensorMap);
}
export const onesLike =
op({onesLike_});
"/**
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the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the
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 *
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on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.
 * See the License for the specific language governing permissions and
limitations under the
License.
 *
=====
```

```
=====
*import {Tensor1D, Tensor2D} from '../tensor';import {convertToTensor} from './tensor_util_env';import
{TensorLike} from '../types';import * as util from './util';import {matMul} from './mat_mul';import {op}
from './operation';import {reshape} from './reshape';
/** Computes the outer product of two vectors, `v1`
and `v2`.
 * @param a = tf.tensor1d([1, 2, 3]);
 * @param b = tf.tensor1d([3, 4, 5]);
 * @param v1 The first vector in the outer product operation.
 * @param v2 The second vector in the outer product operation.
 * @doc {heading: 'Operations', subheading: 'Matrices'}
*/function outerProduct_(v1: Tensor1D|TensorLike, v2: Tensor1D|TensorLike): Tensor2D {
  const $v1 =
convertToTensor(v1, 'v1', 'outerProduct');
  const $v2 =
convertToTensor(v2, 'v2', 'outerProduct');
  util.assert(
    $v1.rank === 1 && $v2.rank === 1,
    () => `Error in outerProduct: inputs must be rank 1, but got ranks ` +
`${$v1.rank} and `${$v2.rank}`.`);
  const v12D = reshape($v1, [-1, 1]);
  const v22D = reshape($v2, [1, -
=====
```

```
1]);\n return matMul(v12D, v22D);\n\n\nexport const outerProduct = op({outerProduct_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {PadV2, PadV2Attrs, PadV2Inputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Pads a `tf.Tensor` with a given value and\n * paddings.\n * This operation implements `CONSTANT` mode. For `REFLECT` and `SYMMETRIC`,\n * refer to `tf.mirrorPad`.\n * Also available are stricter rank-specific methods with the same signature\n * as this method that assert that `paddings` is of given length.\n * - `tf.pad1d`\n * - `tf.pad2d`\n * - `tf.pad3d`\n * - `tf.pad4d`\n *\n * `js`\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * x.pad([[1, 2]]).print();\n *\n * @param x The tensor to pad.\n * @param paddings An array of length `R` (the rank of the tensor), where\n * each element is a length-2 tuple of\n * ints `[padBefore, padAfter]`,\n * specifying how much to pad along each dimension of the tensor.\n * @param\n * constantValue The pad value to use. Defaults to 0.\n * @doc {heading: 'Tensors', subheading:\n * 'Transformations'}\n */\nfunction pad_<T extends Tensor>(\n  x: T|TensorLike, paddings: Array<[number,\n  number]>, constantValue = 0): T {\n  const $x = convertToTensor(x, 'x', 'pad');\n  if ($x.rank === 0) {\n    throw\n    new Error('pad(scalar) is not defined. Pass non-scalar to pad');\n  }\n  const attrs: PadV2Attrs = {paddings,\n  constantValue};\n  const inputs: PadV2Inputs = {x: $x};\n  return ENGINE.runKernel(\n    PadV2, inputs as\n    unknown as NamedTensorMap,\n    attrs as unknown as NamedAttrMap);\n}\n\nexport const pad =\n  op({pad_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n\n*\n\nimport {Tensor1D} from './tensor';\nimport {TensorLike} from './types';\nimport {assert} from './util';\nimport {op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor1D` with a given value and\n * paddings. See `pad` for details.\n */\nfunction pad1d_(\n  x: Tensor1D|TensorLike, paddings: [number, number],\n  constantValue = 0): Tensor1D {\n  assert(\n    paddings.length === 2,\n    () => 'Invalid number of paddings.\n    Must be length of 2.);\n  return pad(x, [paddings], constantValue);\n}\n\nexport const pad1d =\n  op({pad1d_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n\n*\n\nimport {Tensor2D} from './tensor';\nimport {TensorLike} from './types';\nimport {assert} from './util';\nimport {op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor2D` with a given value and\n * paddings. See `pad` for details.\n */\nfunction pad2d_(\n  x: Tensor2D|TensorLike, paddings: [[number, number],
```

```
[number, number]],\n  constantValue = 0): Tensor2D {\n  assert(\n    paddings.length === 2 &&\n    paddings[0].length === 2 &&\n    paddings[1].length === 2,\n    () => 'Invalid number of paddings. Must be\nlength of 2 each.);\n  return pad(x, paddings, constantValue);\n}\n\nexport const pad2d = op({pad2d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n  copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n  the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {Tensor3D} from './tensor';\nimport {TensorLike} from './types';\nimport {assert} from './util';\nimport\n{op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor3D` with a given value and\n  paddings. See `pad` for details.\n */\nfunction pad3d_(\n  x: Tensor3D|TensorLike,\n  paddings: [[number,\n  number], [number, number], [number, number]],\n  constantValue = 0): Tensor3D {\n  assert(\n    paddings.length\n    === 3 && paddings[0].length === 2 &&\n    paddings[1].length === 2 && paddings[2].length === 2,\n    ()\n    => 'Invalid number of paddings. Must be length of 2 each.);\n  return pad(x, paddings, constantValue);\n}\n\nexport\nconst pad3d = op({pad3d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n  compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {Tensor4D} from './tensor';\nimport {TensorLike} from './types';\nimport {assert} from './util';\nimport\n{op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor4D` with a given value and\n  paddings. See `pad` for details.\n */\nfunction pad4d_(\n  x: Tensor4D|TensorLike,\n  paddings:\n  [\n  [number, number], [number, number], [number, number], [number, number]\n  ],\n  constantValue = 0):\n  Tensor4D {\n  assert(\n    paddings.length === 4 && paddings[0].length === 2 &&\n    paddings[1].length ===\n    2 && paddings[2].length === 2 &&\n    paddings[3].length === 2,\n    () => 'Invalid number of paddings. Must\nbe length of 2 each.);\n  return pad(x, paddings, constantValue);\n}\n\nexport const pad4d =\n  op({pad4d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n  Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n  License.\n */
```

```
=====\n\n*/\nimport {ENGINE} from './engine';\nimport {SpaceToBatchND, SpaceToBatchNDAttrs,\nSpaceToBatchNDInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport\n{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {op} from\n './operation';\n\n/**\n * This operation divides "spatial" dimensions `[1, ..., M]` of the input into\n * a grid of\n  blocks of shape `blockShape`, and interleaves these blocks with\n * the "batch" dimension (0) such that in the\n  output, the spatial\n * dimensions `[1, ..., M]` correspond to the position within the grid,\n * and the batch dimension\n  combines both the position within a spatial block\n * and the original batch position. Prior to division into blocks,\n * the spatial dimensions of the input are optionally zero padded\n * according to `paddings`. See below for a precise
```


in dilated pooling. Defaults to `[1, 1]`. If `dilationRate` is a single number, then `dilationHeight == dilationWidth`. If it is greater than 1, then all values of `strides` must be 1.

`@param strides` The strides of the pooling: `[strideHeight, strideWidth]`. If `strides` is a single number, then `strideHeight == strideWidth`.

`@doc {heading: 'Operations', subheading: 'Convolution'}`

```

function pool_<T extends
Tensor3D|Tensor4D>(
  input: T|TensorLike, windowShape: [number, number]|number,
  poolingType: 'avg'|'max', pad: 'valid'|'same'|number,
  dilations?: [number, number]|number, strides?: [number, number]|number)
{
  if (dilations == null) {
    dilations = [1, 1];
  }
  if (strides == null) {
    strides = 1;
  }
  if (pad === 0) {
    pad = 'valid';
  }
  const $x = convertToTensor(input, 'x', 'maxPool');
  let x4D = $x as Tensor4D;
  let reshapedTo4D = false;
  if ($x.rank === 3) {
    reshapedTo4D = true;
    x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);
  }
  util.assert(
    conv_util.eitherStridesOrDilationsAreOne(strides, dilations),
    () => 'Error in pool: Either strides or dilations must be 1. ' +
      `Got strides ${strides} and dilations
      '${dilations}'`);
  const convInfo = conv_util.computePool2DInfo(
    x4D.shape, windowShape, strides,
    dilations, pad);
  const dilation: [number, number] = [
    convInfo.dilationHeight, convInfo.dilationWidth];
  // The following implementation does batchToSpace(pool(spaceToBatch(x)))
  // whenever dilation > 1 since the TF kernels do not support dilation > 1.
  // tslint:disable-next-line:max-line-length
  https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/nn_ops.py#L1037
  let basePadding: number[][];
  if (pad === 'same') {
    basePadding = withSpaceToBatchBasePaddings(
      [convInfo.filterHeight, convInfo.filterWidth], dilation);
  } else {
    basePadding = [[0, 0], [0, 0]];
  }
  const isDilationOne = dilation[0] === 1 && dilation[1] === 1;
  const [adjustedPadding, adjustedCrops] = requiredSpaceToBatchPaddings(
    [convInfo.inHeight, convInfo.inWidth], dilation, basePadding);
  const convertedPad = isDilationOne ? pad : 'valid';
  const convertedX = isDilationOne ? x4D : spaceToBatchND(x4D, dilation, adjustedPadding);
  const forwardOp = poolingType === 'avg' ?
    () => avgPool(convertedX, windowShape, strides, convertedPad) :
    () => maxPool(convertedX, windowShape, strides, convertedPad);
  const y = forwardOp();
  const res = isDilationOne ? y : batchToSpaceND(y, dilation, adjustedCrops);
  if (reshapedTo4D) {
    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;
  }
  return res as T;
}
// Helper function to compute crops and paddings for pool with dilation > 1.
// tslint:disable-next-line:max-line-length
https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/array_ops.py#L2184
function requiredSpaceToBatchPaddings(
  inputShape: [number, number], blockShape: [number, number],
  basePadding: number[][]) {
  const padStart = basePadding.map(b => b[0]);
  const origPadEnd = basePadding.map(b => b[1]);
  const fullInputShape = inputShape.concat(padStart, origPadEnd);
  const padEndExtra = blockShape.map((b, i) => (b - fullInputShape[i] % b) % b);
  const padEnd = origPadEnd.map((s, i) => s + padEndExtra[i]);
  const paddings = blockShape.map(
    (_, i) => [padStart[i], padEnd[i]]);
  const crops = blockShape.map(
    (_, i) => [0, padEndExtra[i]]);
  return [paddings, crops];
}
// Helper function to compute base paddings for pool with dilation > 1.
// tslint:disable-next-line:max-line-length
https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/nn_ops.py#L524
function withSpaceToBatchBasePaddings(
  filterShape: [number, number], dilation: [number, number]) {
  // Spatial dimensions of the filters and the upsampled filters in which we
  // introduce (rate - 1) zeros between consecutive filter values.
  const dilatedFilterShape = filterShape.map((s, i) => {
    return s + (s - 1) * (dilation[i] - 1);
  });
  const padExtraShape = dilatedFilterShape.map(s => s - 1);
  // When padding is odd, we pad more at end, following the same
  // convention as conv2d.
  const padExtraStart = padExtraShape.map(s => Math.floor(s / 2));
  const padExtraEnd = padExtraShape.map((s, i) => s - padExtraStart[i]);
  return padExtraShape.map(
    (_, i) => {
      return [padExtraStart[i], padExtraEnd[i]];
    }
  );
}
export const pool = op({pool_});
*/
**
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* You may obtain a copy of the License at
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* WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====  
* \nimport {ENGINE} from './engine';\nimport {Pow, PowInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes the power of one `tf.Tensor` to another. Supports broadcasting.\n *\n * Given a `tf.Tensor` x and a `tf.Tensor` y, this operation computes x^y for\n * corresponding elements in x and y. The result's dtype will be the upcasted\n * type of the `base` and `exp` dtypes.\n *\n * ```js\n * const a = tf.tensor([[2, 3], [4, 5]])\n * const b = tf.tensor([[1, 2], [3, 0]]).toInt();\n * a.pow(b).print(); // or tf.pow(a, b)\n * ```\n *\n * ```js\n * const a = tf.tensor([[1, 2], [3, 4]])\n * const b = tf.tensor(2).toInt();\n * a.pow(b).print(); // or tf.pow(a, b)\n * ```\n * We also expose `powStrict` which has the same signature as this op and\n * asserts that `base` and `exp` are the same shape (does not broadcast).\n *\n * @param base The base `tf.Tensor` to pow element-wise.\n * @param exp The exponent `tf.Tensor` to pow element-wise.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction pow<T extends Tensor>(base: Tensor|TensorLike, exp: Tensor|TensorLike): T {\n  let $base = convertToTensor(base, 'base', 'pow');\n  let $exp = convertToTensor(exp, 'exp', 'pow');\n  [$base, $exp] = makeTypesMatch($base, $exp);\n  const inputs: PowInputs = {a: $base, b: $exp};\n  return ENGINE.runKernel(Pow, inputs as {} as NamedTensorMap);\n}\n\nexport const pow = op({pow_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====  
* \nimport {ENGINE} from './engine';\nimport {Prelu, PreluInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes leaky rectified linear element-wise with parametric alphas.\n *\n *  $x < 0 ? \alpha * x : f(x) = x$ \n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n * const alpha = tf.scalar(0.1);\n * x.prelu(alpha).print(); // or tf.prelu(x, alpha)\n * ```\n *\n * @param x The input tensor.\n * @param alpha Scaling factor for negative values.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction prelu<T extends Tensor>(x: T|TensorLike, alpha: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'prelu');\n  const $alpha = convertToTensor(alpha, 'alpha', 'prelu');\n  const inputs: PreluInputs = {x: $x, alpha: $alpha};\n  return ENGINE.runKernel(Prelu, inputs as {} as NamedTensorMap);\n}\n\nexport const prelu = op({prelu_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====  
* \nimport {ENGINE} from './engine';\nimport {Prod, ProdAttrs, ProdInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Computes the product of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless
```

```

`keepDims` is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in `axes`. If `keepDims` is true,
the reduced dimensions are retained with length 1. If `axes` has no entries, all dimensions are reduced, and a `tf.Tensor`
with a single element is returned.
const x = tf.tensor1d([1, 2, 3]);
x.prod().print();
// or tf.prod(x)
const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);
const axis = 1;
x.prod(axis).print(); // or tf.prod(x, axis)
@param x The input tensor to compute the product over. If
the dtype is `bool` it will be converted to `int32` and the output dtype will be `int32`.
@param axis The dimension(s) to reduce. By default it reduces all dimensions.
@param keepDims If true, retains reduced dimensions with size 1.
@doc {heading: 'Operations', subheading: 'Reduction'}
function prod_<T extends Tensor>(x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {
  let $x = convertToTensor(x, 'x', 'prod');
  if ($x.dtype === 'bool') {
    // bool is not an allowed type for the underlying kernel.
    $x = cast($x, 'int32');
  }
  const inputs: ProdInputs = {x: $x};
  const attrs: ProdAttrs = {axis, keepDims};
  return ENGINE.runKernel(Prod, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);
}
export const prod = op({prod_});
/**
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 * software distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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 * limitations under the License.
 */
=====
import {ENGINE} from '../engine';
import {Tensor} from '../tensor';
import {DataType, Rank, ShapeMap} from '../types';
import {sizeFromShape} from '../util';
import {op} from '../operation';
/**
 * Creates a `tf.Tensor` with values sampled from a random number generator
 * function defined by the user.
 * @param shape An array of integers defining the output tensor shape.
 * @param randFunction A random number generator function which is called
 * for each element in the output tensor.
 * @param dtype The data type of the output tensor. Defaults to `float32`.
 */
function rand_<R extends Rank>(shape: ShapeMap[R], randFunction: () => number, dtype?: DataType): Tensor<R> {
  const size = sizeFromShape(shape);
  let values = null;
  if (dtype === null || dtype === 'float32') {
    values = new Float32Array(size);
  } else if (dtype === 'int32') {
    values = new Int32Array(size);
  } else if (dtype === 'bool') {
    values = new Uint8Array(size);
  } else {
    throw new Error(`Unknown data type ${dtype}`);
  }
  for (let i = 0; i < size; i++) {
    values[i] = randFunction();
  }
  return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>;
}
export const rand = op({rand_});
/**
 * A port of an algorithm by Johannes Baagøe <baagoe@baagoe.com>, 2010
 * http://baagoe.com/en/RandomMusings/javascript
 * https://github.com/nquinlan/better-random-numbers-for-javascript-mirror
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 * OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN
 * THE SOFTWARE.
 */
(function(global, module, define) {
  function Alea(seed) {
    var me = this, mash = Mash();
    me.next = function() {
      var t = 2091639 * me.s0 + me.c * 2.3283064365386963e-10; // 2^-32
      me.s0 = me.s1;
      me.s1 = me.s2;
      return me.s2 = t - (me.c = t |

```

```

0);\n };\n\n // Apply the seeding algorithm from Baagoe.\n me.c = 1;\n me.s0 = mash(' ');\n me.s1 = mash(' ');\n me.s2 = mash(' '); \n me.s0 -= mash(seed);\n if (me.s0 < 0) { me.s0 += 1; } \n me.s1 -= mash(seed);\n if (me.s1 < 0) { me.s1 += 1; } \n me.s2 -= mash(seed);\n if (me.s2 < 0) { me.s2 += 1; } \n mash = null;\n\n\nfunction copy(f, t) {\n t.c = f.c;\n t.s0 = f.s0;\n t.s1 = f.s1;\n t.s2 = f.s2;\n return t;\n}\n\nfunction impl(seed, opts) {\n var xg = new Alea(seed),\n state = opts && opts.state,\n prng = xg.next;\n prng.int32 = function() { return (xg.next() * 0x100000000) | 0; } \n prng.double = function() {\n return prng() + (prng() * 0x200000 | 0) * 1.1102230246251565e-16; // 2^-53\n };\n prng.quick = prng;\n if (state) {\n if (typeof(state) === 'object') copy(state, xg);\n prng.state = function() { return copy(xg, {}); } \n } \n return prng;\n}\n\nfunction Mash() {\n var n = 0xefc8249d;\n\n var mash = function(data) {\n data = data.toString();\n for (var i = 0; i < data.length; i++) {\n n += data.charCodeAt(i);\n var h = 0.02519603282416938 * n;\n n = h >>> 0;\n h -= n;\n h *= n;\n n = h >>> 0;\n h -= n;\n n += h * 0x100000000; // 2^32\n } \n return (n >>> 0) * 2.3283064365386963e-10; // 2^-32\n };\n\n\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.alea = impl;\n}\n\n})(\n this,\n (typeof module) === 'object' && module, // present in node.js\n (typeof define) === 'function' && define // present with an AMD loader\n)\n\n\n"," A Javascript implementaion of the \"xor128\" prng algorithm by\n// George Marsaglia. See http://www.jstatsoft.org/v08/i14/paper\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n var me = this, strseed = \";\n me.x = 0;\n me.y = 0;\n me.z = 0;\n me.w = 0;\n\n // Set up generator function.\n me.next = function() {\n var t = me.x ^ (me.x << 11);\n me.x = me.y;\n me.y = me.z;\n me.z = me.w;\n return me.w ^= (me.w >>> 19) ^ t ^ (t >>> 8);\n };\n\n if (seed === (seed | 0)) {\n // Integer seed.\n me.x = seed;\n } else {\n // String seed.\n strseed += seed;\n }\n\n // Mix in string seed, then discard an initial batch of 64 values.\n for (var k = 0; k < strseed.length + 64; k++) {\n me.x ^= strseed.charCodeAt(k) | 0;\n me.next();\n }\n}\n\nfunction copy(f, t) {\n t.x = f.x;\n t.y = f.y;\n t.z = f.z;\n t.w = f.w;\n return t;\n}\n\nfunction impl(seed, opts) {\n var xg = new XorGen(seed),\n state = opts && opts.state,\n prng = function() { return (xg.next() >>> 0) / 0x100000000; }; \n prng.double = function() {\n do {\n var top = xg.next() >>> 11,\n bot = (xg.next() >>> 0) / 0x100000000,\n result = (top + bot) / (1 << 21);\n } while (result === 0);\n return result;\n };\n prng.int32 = xg.next;\n prng.quick = prng;\n if (state) {\n if (typeof(state) === 'object') copy(state, xg);\n prng.state = function() { return copy(xg, {}); } \n } \n return prng;\n}\n\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.xor128 = impl;\n}\n\n})(\n this,\n (typeof module) === 'object' && module, // present in node.js\n (typeof define) === 'function' && define // present with an AMD loader\n)\n\n\n"," A Javascript implementaion of the \"xorwow\" prng algorithm by\n// George Marsaglia. See http://www.jstatsoft.org/v08/i14/paper\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n var me = this, strseed = \";\n\n // Set up generator function.\n me.next = function() {\n var t = (me.x ^ (me.x >>> 2));\n me.x = me.y;\n me.y = me.z;\n me.z = me.w;\n me.w = me.v;\n return (me.d = (me.d + 362437 | 0)) +\n (me.v = (me.v ^ (me.v << 4)) ^ (t ^ (t << 1))) | 0;\n };\n\n me.x = 0;\n me.y = 0;\n me.z = 0;\n me.w = 0;\n me.v = 0;\n\n if (seed === (seed | 0)) {\n // Integer seed.\n me.x = seed;\n } else {\n // String seed.\n strseed += seed;\n }\n\n // Mix in string seed, then discard an initial batch of 64 values.\n for (var k = 0; k < strseed.length + 64; k++) {\n me.x ^= strseed.charCodeAt(k) | 0;\n if (k === strseed.length) {\n me.d = me.x << 10 ^ me.x >>> 4;\n }\n me.next();\n }\n}\n\nfunction copy(f, t) {\n t.x = f.x;\n t.y = f.y;\n t.z = f.z;\n t.w = f.w;\n t.v = f.v;\n t.d = f.d;\n return t;\n}\n\nfunction impl(seed, opts) {\n var xg = new XorGen(seed),\n state = opts && opts.state,\n prng = function() { return (xg.next() >>> 0) / 0x100000000; }; \n prng.double = function() {\n do {\n var top = xg.next() >>> 11,\n bot = (xg.next() >>> 0) / 0x100000000,\n result = (top + bot) / (1 << 21);\n } while (result === 0);\n return result;\n };\n prng.int32 = xg.next;\n prng.quick = prng;\n if (state) {\n if (typeof(state) === 'object') copy(state, xg);\n prng.state = function() { return copy(xg, {}); } \n } \n return prng;\n}\n\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.xorwow = impl;\n}\n\n})(\n this,\n (typeof module) === 'object' && module, // present in node.js\n (typeof define) === 'function' && define // present with an AMD loader\n)\n\n\n"," A Javascript implementaion of the \"xorshift7\" algorithm by\n// Franois Panneton and Pierre L'ecuyer:\n\n\n\"On the Xorshift

```


Random Number Generators

```
http://saluc.engr.uconn.edu/refs/crypto/rng/panneton05onthexorshift.pdf\n\n(function(global, module, define)\n{\n\nfunction XorGen(seed) {\n  var me = this;\n\n  // Set up generator function.\n  me.next = function() {\n  // Update xor generator.\n  var X = me.x, i = me.i, t, v, w;\n  t = X[i]; t ^= (t >>> 7); v = t ^ (t <<< 24);\n  t = X[(i + 1) & 7]; v ^= t ^ (t >>> 10);\n  t = X[(i + 3) & 7]; v ^= t ^ (t >>> 3);\n  t = X[(i + 4) & 7]; v ^= t ^ (t <<< 7);\n  t = X[(i + 7) & 7]; t = t ^ (t <<< 13); v ^= t ^ (t <<< 9);\n  X[i] = v;\n  me.i = (i + 1) & 7;\n  return v;\n  };\n\nfunction\ninit(me, seed) {\n  var j, w, X = [];\n\n  if (seed === (seed | 0)) {\n  // Seed state array using a 32-bit integer.\n  w = X[0] = seed;\n  } else {\n  // Seed state using a string.\n  seed = "" + seed;\n  for (j = 0; j < seed.length;\n  ++j) {\n  X[j & 7] = (X[j & 7] << 15) ^\n  (seed.charCodeAt(j) + X[(j + 1) & 7] << 13);\n  }\n  }\n\n  Enforce an array length of 8, not all zeroes.\n  while (X.length < 8) X.push(0);\n  for (j = 0; j < 8 && X[j] === 0;\n  ++j);\n  if (j == 8) w = X[7] = -1; else w = X[j];\n\n  me.x = X;\n  me.i = 0;\n\n  // Discard an initial 256\n  values.\n  for (j = 256; j > 0; --j) {\n  me.next();\n  }\n\n  init(me, seed);\n}\n\nfunction copy(f, t) {\n  t.x =\n  f.x.slice();\n  t.i = f.i;\n  return t;\n}\n\nfunction impl(seed, opts) {\n  if (seed == null) seed = +(new Date);\n  var xg\n  = new XorGen(seed),\n  state = opts && opts.state,\n  prng = function() { return (xg.next() >>> 0) /\n  0x100000000; };\n  prng.double = function() {\n  do {\n  var top = xg.next() >>> 11,\n  bot = (xg.next()\n  >>> 0) / 0x100000000,\n  result = (top + bot) / (1 <<< 21);\n  } while (result === 0);\n  return result;\n  };\n  prng.int32 = xg.next;\n  prng.quick = prng;\n  if (state) {\n  if (state.x) copy(state, xg);\n  prng.state = function() {\n  return copy(xg, {}); }\n  }\n  return prng;\n}\n\nif (module && module.exports) {\n  module.exports = impl;\n} else\nif (define && define.amd) {\n  define(function() { return impl; });\n} else {\n  this.xorshift7 = impl;\n}\n\n(this,\n (typeof module) == 'object' && module, // present in node.js\n (typeof define) == 'function' && define //\n present with an AMD loader\n),\n\n\"// A Javascript implementaion of Richard Brent's Xorgens xor4096\nalgorithm.\n\n// This fast non-cryptographic random number generator is designed for\n// use in Monte-Carlo\nalgorithms. It combines a long-period xorshift\n// generator with a Weyl generator, and it passes all common\nbatteries\n// of stastical tests for randomness while consuming only a few nanoseconds\n// for each prng generated.\nFor background on the generator, see Brent's\n// paper: \"Some long-period random number generators using shifts\nand xors.\n\n// http://arxiv.org/pdf/1004.3115v1.pdf\n\n// Usage:\n\nvar xor4096 = require('xor4096');\n\nrandom = xor4096(1); // Seed with int32 or string.\n\nassert.equal(random(), 0.1520436450538547);\n\n// (0, 1) range, 53 bits.\n\nassert.equal(random.int32(), 1806534897); // signed int32, 32 bits.\n\n\n// For nonzero\nnumeric keys, this impelementation provides a sequence\n// identical to that by Brent's xorgens 3 implementaion in\nC. This\n// implementation also provides for initalizing the generator with\n// string seeds, or for saving and\nrestoring the state of the generator.\n\n\n// On Chrome, this prng benchmarks about 2.1 times slower than\n//\nJavascript's built-in Math.random().\n\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n  var me =\n  this;\n\n  // Set up generator function.\n  me.next = function() {\n  var w = me.w,\n  X = me.X, i = me.i, t, v;\n\n  // Update Weyl generator.\n  me.w = w = (w + 0x61c88647) | 0;\n\n  // Update xor generator.\n  v = X[(i + 34) &\n  127];\n  t = X[(i + ((i + 1) & 127))];\n  v ^= v <<< 13;\n  t ^= t <<< 17;\n  v ^= v >>> 15;\n  t ^= t >>> 12;\n\n  // Update Xor generator array state.\n  v = X[i] = v ^ t;\n  me.i = i;\n\n  // Result is the combination.\n  return (v +\n  (w ^ (w >>> 16))) | 0;\n  };\n\nfunction init(me, seed) {\n  var t, v, i, j, w, X = [], limit = 128;\n  if (seed ===\n  (seed | 0)) {\n  // Numeric seeds initialize v, which is used to generates X.\n  v = seed;\n  seed = null;\n  }\n  else {\n  // String seeds are mixed into v and X one character at a time.\n  seed = seed + '\\0';\n  v = 0;\n  limit = Math.max(limit, seed.length);\n  }\n\n  // Initialize circular array and weyl value.\n  for (i = 0, j = -32; j <\n  limit; ++j) {\n  // Put the unicode characters into the array, and shuffle them.\n  if (seed) v ^=\n  seed.charCodeAt((j + 32) % seed.length);\n\n  // After 32 shuffles, take v as the starting w value.\n  if (j === 0) w\n  = v;\n  v ^= v <<< 10;\n  v ^= v >>> 15;\n  v ^= v <<< 4;\n  v ^= v >>> 13;\n  if (j >= 0) {\n  w = (w +\n  0x61c88647) | 0; // Weyl.\n  t = (X[j & 127] ^ (v + w)); // Combine xor and weyl to init array.\n  i = (0\n  == t) ? i + 1 : 0; // Count zeroes.\n  }\n  }\n\n  // We have detected all zeroes; make the key nonzero.\n  if (i\n  >= 128) {\n  X[(seed && seed.length | 0) & 127] = -1;\n  }\n\n  // Run the generator 512 times to further mix the\n  state before using it.\n  // Factoring this as a function slows the main generator, so it is just\n  // unrolled here.\n  The weyl generator is not advanced while warming up.\n  i = 127;\n  for (j = 4 * 128; j > 0; --j) {\n  v = X[(i +
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34) & 127];\n    t = X[i = ((i + 1) & 127)];\n    v ^= v << 13;\n    t ^= t << 17;\n    v ^= v >>> 15;\n    t ^= t
>>> 12;\n    X[i] = v ^ t;\n  }\n  // Storing state as object members is faster than using closure variables.\n  me.w = w;\n  me.X = X;\n  me.i = i;\n  }\n\n  init(me, seed);\n}\n\nfunction copy(f, t) {\n  t.i = f.i;\n  t.w = f.w;\n  t.X = f.X.slice();\n  return t;\n};\n\nfunction impl(seed, opts) {\n  if (seed == null) seed = +(new Date);\n  var xg =
new XorGen(seed),\n    state = opts && opts.state,\n    prng = function() { return (xg.next() >>> 0) /
0x100000000; }\n  prng.double = function() {\n    do {\n      var top = xg.next() >>> 11,\n          bot = (xg.next()
>>> 0) / 0x100000000,\n          result = (top + bot) / (1 << 21);\n    } while (result === 0);\n    return result;\n  };\n  prng.int32 = xg.next;\n  prng.quick = prng;\n  if (state) {\n    if (state.X) copy(state, xg);\n    prng.state = function() {
return copy(xg, {}); }\n  }\n  return prng;\n}\n\nif (module && module.exports) {\n  module.exports = impl;\n} else
if (define && define.amd) {\n  define(function() { return impl; });\n} else {\n  this.xor4096 = impl;\n}\n\n}\n\n(\n  this,\n  // window object or global\n  (typeof module) == 'object' && module, // present in node.js\n  (typeof define) == 'function' && define // present with an AMD loader\n);\n\n"/" A Javascript implementaion of the
\"Tyche-i\" prng algorithm by\n// Samuel Neves and Filipe Araujo.\n// See https://eden.dei.uc.pt/~sneves/pubs/2011-
snfa2.pdf\n\n(function(global, module, define) {\n\n  function XorGen(seed) {\n    var me = this, strseed = \";\n\n  // Set
up generator function.\n  me.next = function() {\n    var b = me.b, c = me.c, d = me.d, a = me.a;\n    b = (b << 25) ^
(b >>> 7) ^ c;\n    c = (c - d) | 0;\n    d = (d << 24) ^ (d >>> 8) ^ a;\n    a = (a - b) | 0;\n    me.b = b = (b << 20) ^ (b
>>> 12) ^ c;\n    me.c = c = (c - d) | 0;\n    me.d = (d << 16) ^ (c >>> 16) ^ a;\n    return me.a = (a - b) | 0;\n  };\n\n  /* The following is non-inverted tyche, which has better internal\n  * bit diffusion, but which is about 25% slower
than tyche-i in JS.\n  me.next = function() {\n    var a = me.a, b = me.b, c = me.c, d = me.d;\n    a = (me.a + me.b | 0)
>>> 0;\n    d = me.d ^ a; d = d << 16 ^ d >>> 16;\n    c = me.c + d | 0;\n    b = me.b ^ c; b = b << 12 ^ d >>> 20;\n    me.a = a = a + b | 0;\n    d = d ^ a; me.d = d = d << 8 ^ d >>> 24;\n    me.c = c = c + d | 0;\n    b = b ^ c;\n    return
me.b = (b << 7 ^ b >>> 25);\n  }\n\n  *^\n\n  me.a = 0;\n  me.b = 0;\n  me.c = 2654435769 | 0;\n  me.d =
1367130551;\n\n  if (seed === Math.floor(seed)) {\n    // Integer seed.\n    me.a = (seed / 0x100000000) | 0;\n    me.b
= seed | 0;\n  } else {\n    // String seed.\n    strseed += seed;\n  }\n\n  // Mix in string seed, then discard an initial
batch of 64 values.\n  for (var k = 0; k < strseed.length + 20; k++) {\n    me.b ^= strseed.charCodeAt(k) | 0;\n    me.next();\n  }\n\n}\n\nfunction copy(f, t) {\n  t.a = f.a;\n  t.b = f.b;\n  t.c = f.c;\n  t.d = f.d;\n  return t;\n};\n\nfunction
impl(seed, opts) {\n  var xg = new XorGen(seed),\n    state = opts && opts.state,\n    prng = function() { return
(xg.next() >>> 0) / 0x100000000; }\n  prng.double = function() {\n    do {\n      var top = xg.next() >>> 11,\n          bot = (xg.next() >>> 0) / 0x100000000,\n          result = (top + bot) / (1 << 21);\n    } while (result === 0);\n    return
result;\n  };\n  prng.int32 = xg.next;\n  prng.quick = prng;\n  if (state) {\n    if (typeof(state) == 'object') copy(state,
xg);\n    prng.state = function() { return copy(xg, {}); }\n  }\n  return prng;\n}\n\nif (module && module.exports)
{\n  module.exports = impl;\n} else if (define && define.amd) {\n  define(function() { return impl; });\n} else {\n  this.tychei = impl;\n}\n\n}\n\n(\n  this,\n  (typeof module) == 'object' && module, // present in node.js\n  (typeof
define) == 'function' && define // present with an AMD loader\n);\n\n"/"*\n\nCopyright 2014 David
Bau.\n\nPermission is hereby granted, free of charge, to any person obtaining\na copy of this software and
associated documentation files (the\n\"Software\"), to deal in the Software without restriction, including\nwithout
limitation the rights to use, copy, modify, merge, publish,\ndistribute, sublicense, and/or sell copies of the Software,
and to\npermit persons to whom the Software is furnished to do so, subject to\nthe following conditions:\n\nThe
above copyright notice and this permission notice shall be\nincluded in all copies or substantial portions of the
Software.\n\nTHE SOFTWARE IS PROVIDED \"AS IS\", WITHOUT WARRANTY OF ANY KIND,\n\nEXPRESS
OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF\n\nMERCHANTABILITY,
FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.\n\nIN NO EVENT SHALL THE
AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY\n\nCLAIM, DAMAGES OR OTHER
LIABILITY, WHETHER IN AN ACTION OF CONTRACT,\n\nTORT OR OTHERWISE, ARISING FROM, OUT
OF OR IN CONNECTION WITH THE\n\nSOFTWARE OR THE USE OR OTHER DEALINGS IN THE
SOFTWARE.\n\n*/\n\n(function (pool, math) {\n\n  // The following constants are related to IEEE 754
limits.\n\n  var global = this,\n      width = 256, // each RC4 output is 0 <= x < 256\n      chunks = 6, // at least
six RC4 outputs for each double\n      digits = 52, // there are 52 significant digits in a double\n      rngname =

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'random', // rngname: name for Math.random and Math.seedrandom\n  startdenom = math.pow(width, chunks),\n  significance = math.pow(2, digits),\n  overflow = significance * 2,\n  mask = width - 1,\n  nodecrypto; //\n  node.js crypto module, initialized at the bottom.\n\n/\n// seedrandom()\n// This is the seedrandom function\n  described above.\n\n/\nfunction seedrandom(seed, options, callback) {\n  var key = [];\n  options = (options == true) ?\n  { entropy: true } : (options || {});\n  // Flatten the seed string or build one from local entropy if needed.\n  var\n  shortseed = mixkey(flatten(\n  options.entropy ? [seed, toString(pool)] : (\n  seed == null) ? autoseed() : seed, 3),\n  key);\n  // Use the seed to initialize an ARC4 generator.\n  var arc4 = new ARC4(key);\n  // This function returns\n  a random double in [0, 1) that contains\n  // randomness in every bit of the mantissa of the IEEE 754 value.\n  var\n  prng = function() {\n    var n = arc4.g(chunks), // Start with a numerator  $n < 2^{48}$ \n    d = startdenom,\n    // and denominator  $d = 2^{48}$ \n    x = 0; // and no 'extra last byte'.\n    while (n <\n  significance) {\n    // Fill up all significant digits by\n    n = (n + x) * width; // shifting numerator and\n    d *= width; // denominator and generating a\n    x = arc4.g(1); // new least-significant-\n  byte.\n  }\n  while (n >= overflow) {\n    // To avoid rounding up, before adding\n    n /= 2; //\n  last byte, shift everything\n    d /= 2; // right using integer math until\n    x >>>= 1;\n  // we have exactly the desired bits.\n  }\n  return (n + x) / d; // Form the number within [0, 1).\n};\n\nprng.int32 = function() { return arc4.g(4) | 0; }\nprng.quick = function() { return arc4.g(4) / 0x100000000;\n};\nprng.double = prng;\n// Mix the randomness into accumulated entropy.\n  mixkey(tostring(arc4.S), pool);\n\n// Calling convention: what to return as a function of prng, seed, is_math.\n  return (options.pass || callback ||\n  function(prng, seed, is_math_call, state) {\n    if (state) {\n    // Load the arc4 state from the given state if it has\n  an S array.\n    if (state.S) { copy(state, arc4); }\n    // Only provide the .state method if requested via\n  options.state.\n    prng.state = function() { return copy(arc4, {}); }\n  }\n  // If called as a method of\n  Math (Math.seedrandom()), mutate\n  // Math.random because that is how seedrandom.js has worked since\n  v1.0.\n  if (is_math_call) { math[rngname] = prng; return seed; }\n  // Otherwise, it is a newer calling\n  convention, so return the\n  // prng directly.\n  else return prng;\n  }) (\n  prng,\n  shortseed,\n  'global' in\n  options ? options.global : (this == math),\n  options.state);\n}\n\nmath['seed' + rngname] = seedrandom;\n\n/\n//\n  ARC4\n  /\n  /\n  An ARC4 implementation. The constructor takes a key in the form of\n  /\n  an array of at most (width)\n  integers that should be  $0 \leq x < (\text{width})$ .  

  /\n  /\n  The g(count) method returns a pseudorandom integer that\n  concatenates\n  /\n  the next (count) outputs from ARC4. Its return value is a number x\n  /\n  that is in the range  $0 \leq x < (\text{width} \wedge \text{count})$ .  

  /\n  /\n  function ARC4(key) {\n    var t, keylen = key.length,\n    me = this, i = 0, j = me.i = me.j = 0, s\n  = me.S = [];\n    // The empty key [] is treated as [0].\n    if (!keylen) { key = [keylen++]; }\n    // Set up S using the\n  standard key scheduling algorithm.\n    while (i < width) {\n    s[i] = i++; }\n    for (i = 0; i < width; i++) {\n    s[i] =\n  s[j = mask & (j + key[i % keylen]) + (t = s[i])];\n    s[j] = t; }\n    // The "g" method returns the next (count)\n  outputs as one number.\n    (me.g = function(count) {\n    // Using instance members instead of closure state nearly\n  doubles speed.\n    var t, r = 0,\n    i = me.i, j = me.j, s = me.S;\n    while (count-->) {\n    t = s[i = mask & (i +\n  1)];\n    r = r * width + s[mask & ((s[i] = s[j = mask & (j + t)]) + (s[j] = t))];\n    }\n    me.i = i; me.j = j;\n    return\n  r;\n    // For robust unpredictability, the function call below automatically\n    // discards an initial batch of values.\n    This is called RC4-drop[256].\n    // See http://google.com/search?q=rsa+fluhrer+response&btnI\n  }) (width);\n  }\n  /\n  /\n  copy()\n  /\n  Copies internal state of ARC4 to or from a plain object.\n  /\n  /\n  function copy(f, t) {\n    t.i = f.i;\n    t.j = f.j;\n    t.S = f.S.slice();\n    return t;\n  }; \n  /\n  /\n  /\n  flatten()\n  /\n  Converts an object tree to nested arrays of\n  strings.\n  /\n  /\n  function flatten(obj, depth) {\n    var result = [], typ = (typeof obj), prop;\n    if (depth && typ == 'object')\n    {\n    for (prop in obj) {\n    try { result.push(flatten(obj[prop], depth - 1)); } catch (e) {\n    }\n    }\n    }\n    return\n  (result.length ? result : typ == 'string' ? obj : obj + '\\0');\n  }; \n  /\n  /\n  /\n  mixkey()\n  /\n  Mixes a string seed into a key that\n  is an array of integers, and\n  /\n  returns a shortened string seed that is equivalent to the result key.\n  /\n  /\n  function\n  mixkey(seed, key) {\n    var stringseed = seed + "", smear, j = 0;\n    while (j < stringseed.length) {\n    key[mask & j]\n  =\n    mask & ((smear ^= key[mask & j] * 19) + stringseed.charCodeAt(j++));\n    }\n    return\n  toString(key);\n  }; \n  /\n  /\n  /\n  autoseed()\n  /\n  Returns an object for autoseeding, using window.crypto and Node crypto\n  /\n  module if available.\n  /\n  /\n  function autoseed() {\n    try {\n    var out;\n    if (nodecrypto && (out =\n  nodecrypto.randomBytes)) {\n    // The use of 'out' to remember randomBytes makes tight minified code.\n    out

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= out(width);\n } else {\n   out = new Uint8Array(width);\n   (global.crypto ||
global.msCrypto).getRandomValues(out);\n } return toString(out);\n } catch (e) {\n   var browser =
global.navigator,\n   plugins = browser && browser.plugins;\n   return [+new Date, global, plugins,
global.screen, toString(pool)];\n }\n}\n\n/\n// toString()\n// Converts an array of charcodes to a string\n\nfunction
toString(a) {\n   return String.fromCharCode.apply(0, a);\n }\n\n/\n// When seedrandom.js is loaded, we immediately
mix a few bits\n// from the built-in RNG into the entropy pool. Because we do\n// not want to interfere with
deterministic PRNG state later,\n// seedrandom will not call math.random on its own again after\n//
initialization.\n\n/\n//mixkey(math.random(), pool);\n\n/\n// Nodejs and AMD support: export the implementation as a
module using\n// either convention.\n\n/\n//if ((typeof module) == 'object' && module.exports) {\n   module.exports =
seedrandom;\n // When in node.js, try using crypto package for autoseeding.\n   try {\n     nodecrypto =
require('crypto');\n   } catch (ex) {} else if ((typeof define) == 'function' && define.amd) {\n     define(function() {\n
return seedrandom; });\n }\n\n// End anonymous scope, and pass initial values.\n})(\n [], // pool: entropy pool
starts empty\n Math // math: package containing random, pow, and seedrandom\n);\n"," A library of seedable
RNGs implemented in Javascript.\n\n/\n// Usage:\n\n/\n// var seedrandom = require('seedrandom');\n// var random =
seedrandom(1); // or any seed.\n// var x = random(); // 0 <= x < 1. Every bit is random.\n// var x =
random.quick(); // 0 <= x < 1. 32 bits of randomness.\n\n// alea, a 53-bit multiply-with-carry generator by Johannes
Baagøe.\n// Period: ~2^116\n// Reported to pass all BigCrush tests.\nvar alea = require('./lib/alea');\n\n// xor128, a
pure xor-shift generator by George Marsaglia.\n// Period: 2^128-1.\n// Reported to fail: MatrixRank and
LinearComp.\nvar xor128 = require('./lib/xor128');\n\n// xorwow, George Marsaglia's 160-bit xor-shift combined
plus weyl.\n// Period: 2^192-2^32\n// Reported to fail: CollisionOver, SimpPoker, and LinearComp.\nvar xorwow =
require('./lib/xorwow');\n\n// xorshift7, by François Panneton and Pierre L'ecuyer, takes\n// a different approach: it
adds robustness by allowing more shifts\n// than Marsaglia's original three. It is a 7-shift generator\n// with 256 bits,
that passes BigCrush with no systematic failures.\n// Period 2^256-1.\n// No systematic BigCrush failures
reported.\nvar xorshift7 = require('./lib/xorshift7');\n\n// xor4096, by Richard Brent, is a 4096-bit xor-shift with a\n//
very long period that also adds a Weyl generator. It also passes\n// BigCrush with no systematic failures. Its long
period may\n// be useful if you have many generators and need to avoid\n// collisions.\n// Period: 2^4128-2^32.\n//
No systematic BigCrush failures reported.\nvar xor4096 = require('./lib/xor4096');\n\n// Tyche-i, by Samuel Neves
and Filipe Araujo, is a bit-shifting random\n// number generator derived from ChaCha, a modern stream cipher.\n//
https://eden.dei.uc.pt/~sneves/pubs/2011-snfa2.pdf\n// Period: ~2^127\n// No systematic BigCrush failures
reported.\nvar tychei = require('./lib/tychei');\n\n// The original ARC4-based prng included in this library.\n// Period:
~2^1600\nvar sr = require('./seedrandom');\n\nnsr.alea = alea;\nnsr.xor128 = xor128;\nnsr.xorwow =
xorwow;\nnsr.xorshift7 = xorshift7;\nnsr.xor4096 = xor4096;\nnsr.tychei = tychei;\n\nmodule.exports = sr;\n","**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n\n
=====\n
*\n\nimport * as seedrandom from 'seedrandom';\n\nimport {expectNumbersClose, testEpsilon} from
'./test_util';\n\nimport {TypedArray} from './types';\n\nexport interface RandomBase {\n   nextValue():
number;\n }\n\nexport interface RandomGamma {\n   nextValue(): number;\n }\n\nexport interface
RandNormalDataTypes {\n   float32: Float32Array;\n   int32: Int32Array;\n }\n\nexport interface
RandGammaDataTypes {\n   float32: Float32Array;\n   int32: Int32Array;\n }\n\n//
https://en.wikipedia.org/wiki/Marsaglia_polar_method\n\nexport class MPRandGauss implements RandomBase {\n
private mean: number;\n private stdDev: number;\n private nextVal: number;\n private dtype?: keyof
RandNormalDataTypes;\n private truncated?: boolean;\n private upper?: number;\n private lower?: number;\n
private random: seedrandom.prng;\n\n constructor(\n   mean: number, stdDeviation: number, dtype?: keyof

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RandNormalDataTypes, \n   truncated?: boolean, seed?: number) {\n   this.mean = mean;\n   this.stdDev =
stdDeviation;\n   this.dtype = dtype;\n   this.nextVal = NaN;\n   this.truncated = truncated;\n   if (this.truncated)
{\n   this.upper = this.mean + this.stdDev * 2;\n   this.lower = this.mean - this.stdDev * 2;\n   }\n   const
seedValue = seed ? seed : Math.random();\n   this.random = seedrandom.alea(seedValue.toString());\n   }\n\n /**
Returns next sample from a Gaussian distribution. *\n   public nextValue(): number {\n   if (!isNaN(this.nextVal))
{\n   const value = this.nextVal;\n   this.nextVal = NaN;\n   return value;\n   }\n\n   let resultX: number,
resultY: number;\n   let isValid = false;\n   while (!isValid) {\n   let v1: number, v2: number, s: number;\n   do
{\n   v1 = 2 * this.random() - 1;\n   v2 = 2 * this.random() - 1;\n   s = v1 * v1 + v2 * v2;\n   } while (s >=
1 || s === 0);\n\n   const mul = Math.sqrt(-2.0 * Math.log(s) / s);\n   resultX = this.mean + this.stdDev * v1 *
mul;\n   resultY = this.mean + this.stdDev * v2 * mul;\n\n   if (!this.truncated || this.isValidTruncated(resultX))
{\n   isValid = true;\n   }\n   }\n\n   if (!this.truncated || this.isValidTruncated(resultY)) {\n   this.nextVal =
this.convertValue(resultY);\n   }\n   return this.convertValue(resultX);\n   }\n\n /** Handles proper rounding for
non-floating-point numbers. *\n   private convertValue(value: number): number {\n   if (this.dtype == null ||
this.dtype === 'float32') {\n   return value;\n   }\n   return Math.round(value);\n   }\n\n /** Returns true if less
than 2-standard-deviations from the mean. *\n   private isValidTruncated(value: number): boolean {\n   return value
<= this.upper && value >= this.lower;\n   }\n\n\n// Marsaglia, George, and Wai Wan Tsang. 2000. \"A Simple
Method for Generating\n// Gamma Variables.\"\n\nexport class RandGamma implements RandomGamma {\n   private
alpha: number;\n   private beta: number;\n   private d: number;\n   private c: number;\n   private dtype?: keyof
RandGammaDataTypes;\n   private randu: seedrandom.prng;\n   private randn: MPRandGauss;\n\n   constructor(\n
alpha: number, beta: number, dtype: keyof RandGammaDataTypes, \n   seed?: number) {\n   this.alpha = alpha;\n
this.beta = 1 / beta; // convert rate to scale parameter\n   this.dtype = dtype;\n\n   const seedValue = seed ? seed :
Math.random();\n   this.randu = seedrandom.alea(seedValue.toString());\n   this.randn = new MPRandGauss(0, 1,
dtype, false, this.randu());\n\n   if (alpha < 1) {\n   this.d = alpha + (2 / 3);\n   } else {\n   this.d = alpha - (1 /
3);\n   }\n   this.c = 1 / Math.sqrt(9 * this.d);\n   }\n\n /** Returns next sample from a gamma distribution. *\n
public nextValue(): number {\n   let x2: number, v0: number, v1: number, x: number, u: number, v: number;\n
while (true) {\n   do {\n   x = this.randn.nextValue();\n   v = 1 + (this.c * x);\n   } while (v <= 0);\n   v *=
v * v;\n   x2 = x * x;\n   v0 = 1 - (0.331 * x2 * x2);\n   v1 = (0.5 * x2) + (this.d * (1 - v + Math.log(v)));\n   u
= this.randu();\n   if (u < v0 || Math.log(u) < v1) {\n   break;\n   }\n   }\n   v = (1 / this.beta) * this.d * v;\n
if (this.alpha < 1) {\n   v *= Math.pow(this.randu(), 1 / this.alpha);\n   }\n   return this.convertValue(v);\n   }\n
/** Handles proper rounding for non-floating-point numbers. *\n   private convertValue(value: number): number {\n
if (this.dtype === 'float32') {\n   return value;\n   }\n   return Math.round(value);\n   }\n\n\nexport class
UniformRandom implements RandomBase {\n   private min: number;\n   private range: number;\n   private random:
seedrandom.prng;\n   private dtype?: keyof RandNormalDataTypes;\n\n   constructor(\n   min = 0, max = 1, dtype?:
keyof RandNormalDataTypes, \n   seed?: string|number) {\n   this.min = min;\n   this.range = max - min;\n
this.dtype = dtype;\n   if (seed == null) {\n   seed = Math.random();\n   }\n   if (typeof seed === 'number') {\n
seed = seed.toString();\n   }\n\n   if (!this.canReturnFloat() && this.range <= 1) {\n   throw new Error(\n
`The difference between ${min} - ${max} <= 1 and dtype is not float`);\n   }\n   this.random =
seedrandom.alea(seed);\n   }\n\n /** Handles proper rounding for non floating point numbers. *\n   private
canReturnFloat() => \n   (this.dtype == null || this.dtype === 'float32');\n\n   private convertValue(value:
number): number {\n   if (this.canReturnFloat()) {\n   return value;\n   }\n   return Math.round(value);\n   }\n\n
nextValue() {\n   return this.convertValue(this.min + this.range * this.random());\n   }\n\n\nexport function
jarqueBeraNormalityTest(values: TypedArray|number[]) {\n //
https://en.wikipedia.org/wiki/Jarque%E2%80%93Bera\_test\n   const n = values.length;\n   const s =
skewness(values);\n   const k = kurtosis(values);\n   const jb = n / 6 * (Math.pow(s, 2) + 0.25 * Math.pow(k - 3, 2));\n
// JB test requires 2-degrees of freedom from Chi-Square @ 0.95:\n //
http://www.itl.nist.gov/div898/handbook/eda/section3/eda3674.htm\n   const CHI_SQUARE_2DEG = 5.991;\n   if
(jb > CHI_SQUARE_2DEG) {\n   throw new Error(`Invalid p-value for JB: ${jb}`);\n   }\n\n\nexport function
expectArrayInMeanStdRange(\n   actual: TypedArray|number[], expectedMean: number, expectedStdDev:

```

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number, \n  epsilon?: number) {\n  if (epsilon == null) {\n    epsilon = testEpsilon();\n  }\n  const actualMean =
mean(actual);\n  expectNumbersClose(actualMean, expectedMean, epsilon);\n  expectNumbersClose(\n
standardDeviation(actual, actualMean), expectedStdDev, epsilon);\n}\n\nfunction mean(values:
TypedArray|number[]) {\n  let sum = 0;\n  for (let i = 0; i < values.length; i++) {\n    sum += values[i];\n  }\n  return
sum / values.length;\n}\n\nfunction standardDeviation(values: TypedArray|number[], mean: number) {\n  let
squareDiffSum = 0;\n  for (let i = 0; i < values.length; i++) {\n    const diff = values[i] - mean;\n    squareDiffSum
+= diff * diff;\n  }\n  return Math.sqrt(squareDiffSum / values.length);\n}\n\nfunction kurtosis(values:
TypedArray|number[]) {\n  // https://en.wikipedia.org/wiki/Kurtosis\n  const valuesMean = mean(values);\n  const n
= values.length;\n  let sum2 = 0;\n  let sum4 = 0;\n  for (let i = 0; i < n; i++) {\n    const v = values[i] -
valuesMean;\n    sum2 += Math.pow(v, 2);\n    sum4 += Math.pow(v, 4);\n  }\n  return (1 / n) * sum4 / Math.pow((1
/ n) * sum2, 2);\n}\n\nfunction skewness(values: TypedArray|number[]) {\n  //
https://en.wikipedia.org/wiki/Skewness\n  const valuesMean = mean(values);\n  const n = values.length;\n  let sum2
= 0;\n  let sum3 = 0;\n  for (let i = 0; i < n; i++) {\n    const v = values[i] - valuesMean;\n    sum2 += Math.pow(v,
2);\n    sum3 += Math.pow(v, 3);\n  }\n  return (1 / n) * sum3 / Math.pow((1 / (n - 1)) * sum2, 3 / 2);\n}\n\n", "/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {Tensor} from '../tensor';\nimport {Rank, ShapeMap} from '../types';\n\nimport {buffer} from
'/buffer';\nimport {op} from './operation';\nimport {RandGamma} from './rand_util';\n\n/**\n * Creates a `tf.Tensor`
with values sampled from a gamma distribution.\n * \n * ```js\n * tf.randomGamma([2, 2], 1).print();\n * ```\n * \n *
@param shape An array of integers defining the output tensor shape.\n * @param alpha The shape parameter of the
gamma distribution.\n * @param beta The inverse scale parameter of the gamma distribution. Defaults\n * to 1.\n *
@param dtype The data type of the output. Defaults to float32.\n * @param seed The seed for the random number
generator.\n * \n * @doc {heading: 'Tensors', subheading: 'Random'}\n *\nfunction randomGamma<R extends
Rank>(\n  shape: ShapeMap[R], alpha: number, beta = 1, \n  dtype: 'float32'|'int32' = 'float32', seed?: number):
Tensor<R> {\n  if (beta == null) {\n    beta = 1;\n  }\n  if (dtype == null) {\n    dtype = 'float32';\n  }\n  if (dtype !==
'float32' && dtype !== 'int32') {\n    throw new Error(`Unsupported data type ${dtype}`);\n  }\n  const rgamma =
new RandGamma(alpha, beta, dtype, seed);\n  const res = buffer(shape, dtype);\n  for (let i = 0; i < res.values.length;
i++) {\n    res.values[i] = rgamma.nextValue();\n  }\n  return res.toTensor();\n}\n\nexport const randomGamma =
op({randomGamma_});\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*\n\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\n\nimport {buffer}
from './buffer';\nimport {op} from './operation';\nimport {MPRandGauss} from './rand_util';\n\n/**\n * Creates a
`tf.Tensor` with values sampled from a normal distribution.\n * \n * ```js\n * tf.randomNormal([2, 2]).print();\n *
```\n * \n * @param shape An array of integers defining the output tensor shape.\n * @param mean The mean of the
normal distribution.\n * @param stdDev The standard deviation of the normal distribution.\n * @param dtype The
data type of the output.\n * @param seed The seed for the random number generator.\n * \n * @doc {heading:
'Tensors', subheading: 'Random'}\n *\nfunction randomNormal<R extends Rank>(\n shape: ShapeMap[R], mean

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= 0, stdDev = 1, dtype?: 'float32'|'int32',\n seed?: number): Tensor<R> {\n if (dtype != null && (dtype as
DataType) !== 'bool') {\n throw new Error(`Unsupported data type ${dtype}`);\n }\n const randGauss =\n new MPRandGauss(mean, stdDev, dtype, false /* truncated */, seed);\n const res = buffer(shape, dtype);\n for (let i
= 0; i < res.values.length; i++) {\n res.values[i] = randGauss.nextValue();\n }\n return
res.toTensor();\n}\n\nexport const randomNormal = op({randomNormal_});\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {Tensor} from './tensor';\nimport {DataType, Rank, ShapeMap} from './types';\nimport {buffer}
from './buffer';\nimport {op} from './operation';\nimport {UniformRandom} from './rand_util';\n\n/**\n * Creates a
`tf.Tensor` with values sampled from a uniform distribution.\n *\n * The generated values follow a uniform
distribution in the range [minval,\n * maxval). The lower bound minval is included in the range, while the upper\n *
bound maxval is excluded.\n *\n * ``js\n * tf.randomUniform([2, 2]).print();\n * ``\n *\n * @param shape An array
of integers defining the output tensor shape.\n * @param minval The lower bound on the range of random values to
generate.\n * Defaults to 0.\n * @param maxval The upper bound on the range of random values to generate.\n *
Defaults to 1.\n * @param dtype The data type of the output tensor. Defaults to 'float32'.\n *\n * @doc {heading:
'Tensors', subheading: 'Random'}\n *\nfunction randomUniform_<R extends Rank>(\n shape: ShapeMap[R],\n minval = 0,
maxval = 1, dtype: DataType = 'float32',\n seed?: number|string): Tensor<R> {\n const res =
buffer(shape, dtype);\n const random = new UniformRandom(minval, maxval, null, seed);\n for (let i = 0; i <
res.values.length; i++) {\n res.values[i] = random.nextValue();\n }\n return res.toTensor();\n}\n\nexport const
randomUniform = op({randomUniform_});\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Range, RangeAttrs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor1D} from './tensor';\n\n/**\n * Creates a new
`tf.Tensor1D` filled with the numbers in the range provided.\n *\n * The tensor is a is half-open interval meaning it
includes start, but\n * excludes stop. Decrementing ranges and negative step values are also\n * supported.sv\n *\n
*\n * ``js\n * tf.range(0, 9, 2).print();\n * ``\n *\n * @param start An integer start value\n * @param stop An
integer stop value\n * @param step An integer increment (will default to 1 or -1)\n * @param dtype The data type
of the output tensor. Defaults to 'float32'.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *\nexport
function range(\n start: number, stop: number, step = 1,\n dtype: 'float32'|'int32' = 'float32'): Tensor1D {\n if
(step === 0) {\n throw new Error('Cannot have a step of zero');\n }\n const attrs: RangeAttrs = {start, stop,
step, dtype};\n return ENGINE.runKernel(Range, { /* inputs */, attrs as {}} as NamedAttrMap);\n}\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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```

=====
*\n
*\n\nimport {ENGINE} from './engine';\nimport {Real, RealInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns the
real part of a complex (or real) tensor.\n *\n * Given a tensor input, this operation returns a tensor of type float that
is\n * the real part of each element in input considered as a complex number.\n *\n * If the input is real, it simply
makes a clone.\n *\n * ``js\n * const x = tf.complex([-2.25, 3.25], [4.75, 5.75]);\n * tf.real(x).print();\n * ``\n *\n *
@doc {heading: 'Tensors', subheading: 'Creation'}\n *\nfunction real_<T extends Tensor>(input: T|TensorLike): T
{\n const $input = convertToTensor(input, 'input', 'real');\n\n const inputs: RealInputs = {input: $input};\n return
ENGINE.runKernel(Real, inputs as { } as NamedTensorMap);\n}\n\nexport const real = op({real_});\n",/**\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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```

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*\n
*\n\nimport {ENGINE} from './engine';\nimport {Reciprocal, ReciprocalInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
reciprocal of x element-wise: `1 / x`\n *\n * ``js\n * const x = tf.tensor1d([0, 1, 2]);\n *\n * x.reciprocal().print(); //
or tf.reciprocal(x)\n * ``\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic
math'}\n *\nfunction reciprocal_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x',
'reciprocal');\n\n const inputs: ReciprocalInputs = {x: $x};\n return ENGINE.runKernel(Reciprocal, inputs as { } as
NamedTensorMap);\n}\n\nexport const reciprocal = op({reciprocal_});\n",/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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```

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=====
*\n
*\n\nimport {ENGINE} from './engine';\nimport {Relu, ReluInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
rectified linear element-wise: `max(x, 0)`.\n *\n * ``js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n *\n * x.relu().print(); //
or tf.relu(x)\n * ``\n *\n * @param x The input tensor. If the dtype is `bool`, the output dtype will
be\n * `int32`.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n *\nfunction relu_<T extends
Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'relu');\n\n const inputs: ReluInputs = {x:
$x};\n\n return ENGINE.runKernel(Relu, inputs as { } as NamedTensorMap);\n}\n\nexport const relu =
op({relu_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====

```



```

*\n\nimport {ENGINE} from './engine';\nimport {Relu6, Relu6Inputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
rectified linear 6 element-wise: `min(max(x, 0), 6)`.\n * \n * `x` is a `tf.Tensor` of shape [1, 2, -3, 8].\n * \n *
`x.relu6().print();` // or `tf.relu6(x)`\n * \n * @param x The input tensor. If the dtype is `bool`, the output dtype will
be `int32`.\n * \n * @doc {heading: 'Operations', subheading: 'Basic math'}\n *\nfunction relu6_<T extends
Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'relu6');\n \n const inputs: Relu6Inputs = {x:
$x};\n \n return ENGINE.runKernel(Relu6, inputs as {} as NamedTensorMap);\n}\n\nexport const relu6 =
op({relu6_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====

```

```

*\n\nimport {ENGINE} from './engine';\nimport {Reverse, ReverseAttrs, ReverseInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Reverses a `tf.Tensor` along a specified
axis.\n * \n * Also available are stricter rank-specific methods that assert that `x` is\n * of the given rank:\n * -
`tf.reverse1d`\n * - `tf.reverse2d`\n * - `tf.reverse3d`\n * - `tf.reverse4d`\n * \n * Except `tf.reverse1d` (which
does not have axis param), all methods have\n * same signature as this method.\n * \n * `x` is a `tf.Tensor` of shape [1, 2, 3, 4].\n * \n * `x.reverse().print();`\n * \n * `x` is a `tf.Tensor` of shape [1, 2, 3, 4], [2, 2].\n * \n *
`const axis = 1;`\n * `x.reverse(axis).print();`\n * \n * @param x The input tensor to be reversed.\n * @param
axis The set of dimensions to reverse. Must be in the\n * range [-rank(x), rank(x)]. Defaults to all axes.\n * \n *
@doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n *\nfunction reverse_<T extends Tensor>(x:
T|TensorLike, axis?: number|number[]): T {\n const $x = convertToTensor(x, 'x', 'reverse');\n \n const inputs:
ReverseInputs = {x: $x};\n const attrs: ReverseAttrs = {dims: axis};\n \n return ENGINE.runKernel(\n Reverse,
inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const reverse =
op({reverse_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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```

```

*\n\nimport {Tensor1D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport * as util from './util';\nimport {op} from './operation';\nimport {reverse} from
 './reverse';\n\n/**\n * Reverses a `tf.Tensor1D`.\n * \n * @param x The input tensor.\n *\nfunction reverse1d_(x:
Tensor1D|TensorLike): Tensor1D {\n const $x = convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank ===
1,\n () => `Error in reverse1D: x must be rank 1 but got rank ${$x.rank}.`);\n return reverse($x, 0);\n}\n\nexport
const reverse1d = op({reverse1d_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====
*\n\nimport {Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\nimport {op} from './operation';\nimport {reverse} from\n './reverse';\n\n/**\n * Reverses a `tf.Tensor2D` along a specified axis.\n * @param x The input tensor.\n * @param axis The set of dimensions to reverse. Must be in the\n * range [-rank(x), rank(x)]. Defaults to all axes.\n */\nfunction reverse2d(x: Tensor2D|TensorLike, axis?: number|number[]): Tensor2D {\n const $x =\n convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank === 2,\n () => `Error in reverse2D: x must be rank 2\n but got rank ${$x.rank}.`);\n return reverse($x, axis);\n}\n\nexport const reverse2d = op({reverse2d});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====
*\n\nimport {Tensor3D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\nimport {op} from './operation';\nimport {reverse} from\n './reverse';\n\n/**\n * Reverses a `tf.Tensor3D` along a specified axis.\n * @param x The input tensor.\n * @param axis The set of dimensions to reverse. Must be in the\n * range [-rank(x), rank(x)]. Defaults to all axes.\n */\nfunction reverse3d(x: Tensor3D|TensorLike, axis?: number|number[]): Tensor3D {\n const $x =\n convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank === 3,\n () => `Error in reverse3D: x must be rank 3\n but got rank ${$x.rank}.`);\n return reverse($x, axis);\n}\n\nexport const reverse3d = op({reverse3d});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====
*\n\nimport {Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\nimport {op} from './operation';\nimport {reverse} from\n './reverse';\n\n/**\n * Reverses a `tf.Tensor4D` along a specified axis.\n * @param x The input tensor.\n * @param axis The set of dimensions to reverse. Must be in the\n * range [-rank(x), rank(x)]. Defaults to all axes.\n */\nfunction reverse4d(x: Tensor4D|TensorLike, axis?: number|number[]): Tensor4D {\n const $x =\n convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank === 4,\n () => `Error in reverse4D: x must be rank 4\n but got rank ${$x.rank}.`);\n return reverse($x, axis);\n}\n\nexport const reverse4d = op({reverse4d});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====
*\n\nimport {ENGINE} from './engine';\nimport {Round, RoundInputs} from './kernel_names';\nimport {Tensor}\n from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
```

```

round of input `tf.Tensor` element-wise: `round(x)`.\n * It implements banker's rounding.\n *\n * ``js\n * const x =
tf.tensor1d([.6, 1.1, -3.3]);\n *\n * x.round().print(); // or tf.round(x)\n *\n * ``\n * @param x The input tensor.\n *\n *
@doc {heading: 'Operations', subheading: 'Basic math'}\n *\nfunction round_<T extends Tensor>(x:
T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'round');\n const inputs: RoundInputs = {x: $x};\n\n return
ENGINE.runKernel(Round, inputs as { } as NamedTensorMap);\n}\n\nexport const round = op({round_});\n", /**\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
\n
*\n\nimport {ENGINE} from './engine';\nimport {Rsqrt, RsqrtInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
'./tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n**\n * Computes
reciprocal of square root of the input `tf.Tensor` element-wise:\n *\n * `y = 1 / sqrt(x)`\n *\n * ``js\n * const x =
tf.tensor1d([1, 2, 4, -1]);\n *\n * x.rsqrt().print(); // or tf.rsqrt(x)\n *\n * ``\n * @param x The input tensor.\n *\n *
@doc {heading: 'Operations', subheading: 'Basic math'}\n *\nfunction rsqrt_<T extends Tensor>(x: T|TensorLike):
T {\n const $x = convertToTensor(x, 'x', 'rsqrt');\n\n const inputs: RsqrtInputs = {x: $x};\n\n return
ENGINE.runKernel(Rsqrt, inputs as { } as NamedTensorMap);\n}\n\nexport const rsqrt = op({rsqrt_});\n", /**\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====
\n
*\n\nimport {Scalar} from './tensor';\nimport {DataType} from './types';\nimport {isTypedArray} from
'./util';\nimport {makeTensor} from './tensor_ops_util';\n\n**\n * Creates rank-0 `tf.Tensor` (scalar) with the
provided value and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we
recommend using `tf.scalar` as it makes the code more readable.\n *\n * ``js\n * tf.scalar(3.14).print();\n *\n * ``\n *\n * @param value The value of the scalar.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors',
subheading: 'Creation'}\n *\nexport function scalar(\n value: number|boolean|string|Uint8Array, dtype?:
DataType): Scalar {\n if (((isTypedArray(value) && dtype !== 'string') || Array.isArray(value)) &&\n dtype !==
'complex64') {\n throw new Error(\n 'Error creating a new Scalar: value must be a primitive ' +\n
(number|boolean|string));\n }\n if (dtype === 'string' && isTypedArray(value) &&\n !(value instanceof
Uint8Array)) {\n throw new Error(\n 'When making a scalar from encoded string, ' +\n
'the value must be\n `Uint8Array`.');\n }\n const shape: number[] = [];\n const inferredShape: number[] = [];\n return
makeTensor(value, shape, inferredShape, dtype) as Scalar;\n}\n", /**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
\n
*\n\nimport {ENGINE} from './engine';\nimport {Selu, SeluInputs} from './kernel_names';\nimport {Tensor} from
'./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from

```

```
./tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n**\n * Computes scaled exponential linear element-wise.\n * $x < 0 ? scale * alpha * (exp(x) - 1) : x$ \n *tf.tensor1d([-1, 2, -3, 4]);\n * x .selu().print(); // or tf.selu(x)\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n *
function selu<T extends Tensor>(x: T|TensorLike): T {\n * const $x = convertToTensor(x, 'x', 'selu');\n * const inputs: SeluInputs = {x: $x};\n * return ENGINE.runKernel(Selu, inputs as {} as NamedTensorMap);\n *}\n *
export const selu = op({selu_});\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n *\n *
import {Tensor3D, Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {conv2d} from './conv2d';\nimport {depthwiseConv2d} from './depthwise_conv2d';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n**\n * 2-D convolution with separable filters.\n * Performs a depthwise convolution that acts separately on channels followed\n * by a pointwise convolution that mixes channels. Note that this is\n * separability between dimensions [1, 2] and 3, not spatial separability\n * between dimensions 1 and 2.\n * See [https://www.tensorflow.org/api_docs/python/tf/nn/separable_conv2d]\n * (https://www.tensorflow.org/api_docs/python/tf/nn/separable_conv2d)\n * for more details.\n * @param x The input tensor, of rank 4 or rank 3, of shape\n * [batch, height, width, inChannels]. If rank 3, batch of 1 is\n * assumed.\n * @param depthwiseFilter The depthwise filter tensor, rank 4, of shape\n * [filterHeight, filterWidth, inChannels, channelMultiplier]. This is\n * the filter used in the first step.\n * @param pointwiseFilter The pointwise filter tensor, rank 4, of shape\n * [1, 1, inChannels * channelMultiplier, outChannels]. This is\n * the filter used in the second step.\n * @param strides The strides of the convolution: [strideHeight,\n * strideWidth]. If strides is a single number, then\n * strideHeight == strideWidth.\n * @param pad The type of padding algorithm.\n * - 'same' and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - 'valid': output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide: [https://www.tensorflow.org/api_guides/python/nn#Convolution]\n * (https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dilations The dilation rates: [dilationHeight, dilationWidth]\n * in which we sample input values across the height and width dimensions\n * in atrous convolution. Defaults to [1, 1]. If `rate` is a single\n * number, then dilationHeight == dilationWidth. If it is greater than\n * 1, then all values of `strides` must be 1.\n * @param dataType: An optional string from: "NHWC", "NCHW". Defaults to\n * "NHWC". Specify the data format of the input and output data. With the\n * default format "NHWC", the data is stored in the order of: [batch,\n * height, width, channels]. Only "NHWC" is currently supported.\n *
@doc {heading: 'Operations', subheading: 'Convolution'}\n *
function separableConv2d<T extends Tensor3D|Tensor4D>(\n * x: T|TensorLike,\n * depthwiseFilter: Tensor4D|TensorLike,\n * pointwiseFilter: Tensor4D|TensorLike, strides: [number, number][\n * number, pad: 'valid'|'same', dilation: [number, number][\n * number = [1, 1],\n * dataType: 'NHWC'|'NCHW' = 'NHWC'): T {\n * const $x = convertToTensor(x, 'x', 'separableConv2d');\n * const $depthwiseFilter =\n * convertToTensor(depthwiseFilter, 'depthwiseFilter', 'separableConv2d');\n * const $pointwiseFilter =\n * convertToTensor(pointwiseFilter, 'pointwiseFilter', 'separableConv2d');\n * let x4D = $x as Tensor4D;\n * let reshapedTo4D = false;\n * if ($x.rank === 3) {\n * reshapedTo4D = true;\n * x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n * }\n * if (dataType === 'NCHW') {\n * throw new Error(\n * 'separableConv2d currently does not support dataType NCHW; only '\n * +\n * 'NHWC is supported');\n * }\n * util.assert(\n * x4D.rank === 4,\n * () => `Error in separableConv2d: input must be rank 4, but got ` +\n * `rank ${x4D.rank}.`);\n * util.assert(\n * $depthwiseFilter.rank === 4,\n * () => `Error in separableConv2d:
```

```

depthwise filter must be rank 4, but `
`got rank ${$depthwiseFilter.rank}.`);
util.assert(
 $pointwiseFilter.rank === 4,
 () => `Error in separableConv2d: pointwise filter must be rank 4, but `
`got rank ${$depthwiseFilter.rank}.`);
util.assert(
 $pointwiseFilter.shape[0] === 1,
 () => `Error in separableConv2d: the first dimension of pointwise filter `
`must be 1, but got
${$pointwiseFilter.shape[0]}.`);
util.assert(
 $pointwiseFilter.shape[1] === 1,
 () => `Error in separableConv2d: the second dimension of pointwise `
`filter must be 1, but got
${$pointwiseFilter.shape[1]}.`);
const inChannels = $depthwiseFilter.shape[2];
const channelMultiplier =
 $depthwiseFilter.shape[3];
util.assert(
 $pointwiseFilter.shape[2] === inChannels * channelMultiplier,
 ()
=> `Error in separableConv2d: the third dimension of pointwise filter `
`must be ${inChannels *
channelMultiplier}, `
`but got ${$pointwiseFilter.shape[2]}.`);
const depthwise = depthwiseConv2d(
 x4D, $depthwiseFilter, strides, pad, dataFormat, dilation);
const pointwiseStride = 1;
const res =
conv2d(depthwise, $pointwiseFilter, pointwiseStride, 'valid', dataFormat);
if (reshapedTo4D) {
 return
 reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;
}
return res as T;
}
export const
separableConv2d = op({separableConv2d_});
"/**
 * @license
 * Copyright 2020 Google Inc. All Rights
Reserved.
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file
except in compliance with the License.
 * You may obtain a copy of the License at
 *
 * http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing,
software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language
governing permissions and
 * limitations under the License.
 */
=====
*/
import {Tensor, TensorBuffer} from '../tensor';
import {convertToTensor} from '../tensor_util_env';
import
{TensorLike} from '../types';
import * as util from '../util';
/**
 * Computes the difference between two lists of
numbers.
 *
 * Given a Tensor `x` and a Tensor `y`, this operation returns a Tensor `out`
 * that represents all
values that are in `x` but not in `y`. The returned
 * Tensor `out` is sorted in the same order that the numbers appear
in `x`
 * (duplicates are preserved). This operation also returns a Tensor indices that
 * represents the position of
each out element in `x`. In other words:
 *
 * out[i] = x[idx[i]] for i in [0, 1, ..., out.length - 1]
 *
 *
 * const x = [1, 2, 3, 4, 5, 6];
 * const y = [1, 3, 5];
 * const [out, indices] = await tf.setdiff1dAsync(x, y);
 *
 * out.print(); // [2, 4, 6]
 * indices.print(); // [1, 3, 5]
 *
 * @param x 1-D Tensor. Values to keep.
 * @param y 1-D Tensor. Must have the same type as x. Values to exclude in the
 * output.
 * @returns Promise
of Tensor tuple [out, indices].
 * out: Tensor with the same type as x.
 * indices: A Tensor of type int32.
 *
 * @doc {heading: 'Tensors', subheading: 'Transformations'}
 */
@async function setdiff1dAsync_(
 x:
 Tensor|TensorLike, y: Tensor|TensorLike): Promise<[Tensor, Tensor]> {
 const $x = convertToTensor(x, 'x',
'setdiff1d');
 const $y = convertToTensor(y, 'y', 'setdiff1d');
 util.assert(
 $x.dtype === $y.dtype,
 () =>
`x and y should have the same dtype, but got x (${
 $x.dtype
}) and y (${
 $y.dtype
}).`);
 util.assert(
 $x.rank === 1,
 () =>
`x should be 1D tensor, but got x (${
 $x.shape
}).`);
 util.assert(
 $y.rank === 1,
 () =>
`y should be 1D tensor, but got y (${
 $y.shape
}).`);
 const xVals = await $x.data();
 const yVals = await
 $y.data();
 const ySet = new Set(yVals);
 let outputSize = 0;
 for (let i = 0; i < xVals.length; i++) {
 if
 (!ySet.has(xVals[i])) {
 outputSize++;
 }
 }
 const buffer = new TensorBuffer([outputSize],
 $x.dtype);
 const indices = new TensorBuffer([outputSize], 'int32');
 for (let i = 0, p = 0; i < xVals.length; i++)
 {
 if
 (!ySet.has(xVals[i])) {
 buffer.values[p] = xVals[i];
 indices.values[p] = i;
 p++;
 }
 }
 return [buffer.toTensor(), indices.toTensor()];
}
export const setdiff1dAsync = setdiff1dAsync_;
"/**
 * @license
 * Copyright 2018 Google LLC. All Rights Reserved.
 * Licensed under the Apache License, Version
2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a
copy of the License at
 *
 * http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable
law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language
governing permissions and
 * limitations under the License.
 */

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {Sign, SignInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Returns an
element-wise indication of the sign of a number.\n *\n * ``js\n * const x = tf.tensor1d([.6, 1.1, -3.3, NaN, 0]);\n *\n
 * x.sign().print(); // or tf.sign(x)\n * ``\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction sign_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'sign');\n const inputs: SignInputs = {x: $x};\n return ENGINE.runKernel(Sign, inputs as
{} as NamedTensorMap);\n}\n\nexport const sign = op({sign_});\n"/**\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {Sin, SinInputs} from './kernel_names';\nimport {Tensor} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes sin
of the input Tensor element-wise: `sin(x)`\n *\n * ``js\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3 / 4]);\n
*\n * x.sin().print(); // or tf.sin(x)\n * ``\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction sin_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'sin');\n\n const inputs: SinInputs = {x: $x};\n\n return ENGINE.runKernel(Sin, inputs as
{} as NamedTensorMap);\n}\n\nexport const sin = op({sin_});\n"/**\n * @license\n * Copyright 2018 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {Sinh, SinhInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
hyperbolic sin of the input `tf.Tensor` element-wise: `sinh(x)`\n *\n * ``js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n
*\n * x.sinh().print(); // or tf.sinh(x)\n * ``\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction sinh_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'sinh');\n const inputs: SinhInputs = {x: $x};\n return ENGINE.runKernel(Sinh, inputs as
{} as NamedTensorMap);\n}\n\nexport const sinh = op({sinh_});\n"/**\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {Tensor1D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from

```

```

./slice';\n\n/**\n * Extracts a 1D slice from 1D array starting at coordinates `begin` and is\n * of length `size`. See `slice` for details.\n *\nfunction slice1d_(\n x: Tensor1D|TensorLike, begin: number, size: number): Tensor1D {\n const $x = convertToTensor(x, 'x', 'slice1d');\n util.assert(\n $x.rank === 1,\n () =>\n `slice1d expects a rank-1 tensor, but got a rank-${$x.rank} tensor`);\n return slice($x, [begin], [size]);\n}\n\nexport const slice1d =\n op({slice1d_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

```

```

=====\n
*\n\nimport {Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from\n './slice';\n\n/**\n * Extracts a 2D slice from a 2D array starting at coordinates `begin` and\n * is of size `size`. See `slice` for details.\n *\nfunction slice2d_(\n x: Tensor2D|TensorLike, begin: [number, number],\n size: [number,\n number]): Tensor2D {\n const $x = convertToTensor(x, 'x', 'slice2d');\n util.assert(\n $x.rank === 2,\n ()\n =>\n `slice2d expects a rank-2 tensor, but got a rank-${$x.rank} tensor`);\n return slice($x, begin,\n size);\n}\n\nexport const slice2d = op({slice2d_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\n\nimport {Tensor3D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from\n './slice';\n\n/**\n * Extracts a 3D slice from a 3D array starting at coordinates `begin` and\n * is of size `size`. See `slice` for details.\n *\nfunction slice3d_(\n x: Tensor3D|TensorLike, begin: [number, number, number],\n size: [number, number, number]): Tensor3D {\n const $x = convertToTensor(x, 'x', 'slice3d');\n util.assert(\n $x.rank\n === 3,\n () =>\n `slice3d expects a rank-3 tensor, but got a rank-${$x.rank} tensor`);\n return slice($x,\n begin, size);\n}\n\nexport const slice3d = op({slice3d_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\n\nimport {Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from\n './slice';\n\n/**\n * Extracts a 4D slice from a 4D array starting at coordinates `begin` and\n * is of size `size`. See `slice` for details.\n *\nfunction slice4d_(\n x: Tensor4D|TensorLike, begin: [number, number, number,\n number],\n size: [number, number, number, number]): Tensor4D {\n const $x = convertToTensor(x, 'x',\n 'slice4d');\n util.assert(\n $x.rank === 4,\n () =>\n `slice4d expects a rank-4 tensor, but got a rank-\n ${$x.rank} tensor`);\n return slice($x, begin, size);\n}\n\nexport const slice4d = op({slice4d_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version

```

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```
=====
*\n\nimport {ENGINE} from './engine';\nimport {Softmax, SoftmaxAttrs, SoftmaxInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
 {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes the softmax normalized vector
 given the logits.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * a.softmax().print(); // or tf.softmax(a)\n *
 ```\n *\n * ```js\n * const a = tf.tensor2d([2, 4, 6, 1, 2, 3], [2, 3]);\n * a.softmax().print(); // or tf.softmax(a)\n *
 ```\n *\n * @param logits The logits array.\n * @param dim The dimension softmax would be performed on.
 Defaults to -1 which indicates the last dimension.\n *\n * @doc {heading: 'Operations', subheading:
 'Normalization'}\n *\nfunction softmax<T extends Tensor>(logits: T|TensorLike, dim = -1): T {\n const $logits =
 convertToTensor(logits, 'logits', 'softmax', 'float32');\n\n if (dim === -1) {\n dim = $logits.rank - 1;\n }\n if (dim
 !== $logits.rank - 1) {\n throw Error(\n 'Softmax along a non-last dimension is not yet supported.' +\n
 '\nLogits was rank ${$logits.rank} and dim was ${dim}');\n }\n\n const inputs: SoftmaxInputs = {logits: $logits};\n
 const attrs: SoftmaxAttrs = {dim};\n\n return ENGINE.runKernel(\n Softmax, inputs as {} as
 NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const softmax = op({softmax});\n", /**\n *
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 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a
 copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable
 law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.
```

```
=====
*\n\nimport {ENGINE} from './engine';\nimport {FFT, FFTInputs} from './kernel_names';\nimport {Tensor}
 from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {assert} from './util';\nimport
 {op} from './operation';\n\n/**\n * Fast Fourier transform.\n *\n * Computes the 1-dimensional discrete Fourier
 transform over the inner-most\n * dimension of input.\n *\n * ```js\n * const real = tf.tensor1d([1, 2, 3]);\n * const
 imag = tf.tensor1d([1, 2, 3]);\n * const x = tf.complex(real, imag);\n * x.fft().print(); // tf.spectral.fft(x).print();\n *
 ```\n *\n * @param input The complex input to compute an fft over.\n *\n * @doc {heading: 'Operations', subheading:
 'Spectral', namespace: 'spectral'}\n *\nfunction fft_(input: Tensor): Tensor {\n  assert(\n    input.dtype ===
 'complex64',\n    () => `The dtype for tf.spectral.fft() must be complex64` +\n    ` but got ${input.dtype}.`);\n\n  const inputs: FFTInputs = {input};\n\n  return ENGINE.runKernel(FFT, inputs as {} as
 NamedTensorMap);\n}\n\nexport const fft = op({fft});\n", /**\n *
 @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License"); you may not use this
 file except in compliance with the License. You may obtain a copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable
 law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.
```

```
=====
*\n\nimport {ENGINE} from './engine';\nimport {IFFT, IFFTInputs} from './kernel_names';\nimport {Tensor}
 from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {assert} from './util';\nimport
 {op} from './operation';\n\n/**\n * Inverse fast Fourier transform.\n *\n * Computes the inverse 1-dimensional
 discrete Fourier transform over the\n * inner-most dimension of input.\n *\n * ```js\n * const real = tf.tensor1d([1, 2,
```



```

3]);\n * const imag = tf.tensor1d([1, 2, 3]);\n * const x = tf.complex(real, imag);\n * \n * x.ifft().print(); //
tf.spectral.ifft(x).print();\n * ``\n * @param input The complex input to compute an ifft over.\n * \n * @doc
{heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n * \nfunction ifft_(input: Tensor): Tensor {\n
assert(\n  input.dtype === 'complex64',\n  () => `The dtype for tf.spectral.ifft() must be complex64` +\n
`but got ${input.dtype}.`);\n\n const inputs: IFFTInputs = {input};\n\n return ENGINE.runKernel(IFFT, inputs as
{} as NamedTensorMap);\n}\n\nexport const ifft = op({ifft_});\n"/**\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {Tensor, Tensor2D} from '../tensor';\nimport {complex} from '../complex';\nimport {concat} from
'./concat';\nimport {imag} from './imag';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport
{real} from './real';\nimport {reshape} from './reshape';\nimport {reverse} from './reverse';\nimport {scalar} from
'./scalar';\nimport {slice} from './slice';\nimport {ifft} from './ifft';\n\n**\n * Inversed real value input fast
Fourier transform.\n * \n * Computes the 1-dimensional inversed discrete Fourier transform over the\n * inner-most
dimension of the real input.\n * \n * ``js\n * const real = tf.tensor1d([1, 2, 3]);\n * const imag = tf.tensor1d([0, 0,
0]);\n * const x = tf.complex(real, imag);\n * \n * x.irfft().print();\n * ``\n * @param input The real value input to
compute an irfft over.\n * \n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n
*\nfunction irfft_(input: Tensor): Tensor {\n  const innerDimensionSize = input.shape[input.shape.length - 1];\n
const batch = input.size / innerDimensionSize;\n  let ret: Tensor;\n  if (innerDimensionSize <= 2) {\n    const
complexInput = reshape(input, [batch, innerDimensionSize]);\n    ret = ifft(complexInput);\n  } else {\n    // The
length of unique components of the DFT of a real-valued signal\n    // is 2 * (input_len - 1)\n    const outputShape =
[batch, 2 * (innerDimensionSize - 1)];\n    const realInput = reshape(real(input), [batch, innerDimensionSize]);\n
const imagInput = reshape(imag(input), [batch, innerDimensionSize]);\n\n    const realConjugate =\nreverse(slice(realInput, [0, 1], [batch, innerDimensionSize - 2], 1));\n    const imagConjugate: Tensor2D = mul(\n
reverse(slice(imagInput, [0, 1], [batch, innerDimensionSize - 2], 1),\n      scalar(-1));\n\n    const r =
concat([realInput, realConjugate], 1);\n    const i = concat([imagInput, imagConjugate], 1);\n    const complexInput
=\n      reshape(complex(r, i), [outputShape[0], outputShape[1]]);\n    ret = ifft(complexInput);\n  }\n  ret =
real(ret);\n  // reshape the result if the input is 3D tensor.\n  if (input.rank === 3 && input.shape[0] !== 0) {\n
const temp = ret;\n    const batch = input.shape[0];\n    ret = reshape(ret, [batch, ret.shape[0] / batch, ret.shape[1]]);\n
temp.dispose();\n  }\n  return ret;\n}\n\nexport const irfft = op({irfft_});\n"/**\n * @license\n * Copyright 2020
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may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from '../engine';\nimport {SplitV, SplitVAttrs, SplitVInputs} from '../kernel_names';\nimport
{NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
'./tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
'./types';\n\nimport {op} from './operation';\n\n**\n * Splits a `tf.Tensor` into sub tensors.\n * \n * If
`numOrSizeSplits` is a number, splits `x` along dimension `axis` into `numOrSizeSplits` smaller tensors.\n *
Requires that `numOrSizeSplits` evenly divides `x.shape[axis]`.\n * \n * If `numOrSizeSplits` is a number array,
splits `x` into\n * `numOrSizeSplits.length` pieces. The shape of the `i`-th piece has the\n * same size as `x` except

```

along dimension `axis` where the size is `numOrSizeSplits[i]`. Can contain one -1 indicating that dimension is to be inferred. Defaults to 0 (the first dimension).

Either an integer indicating the number of splits along the axis or an array of integers containing the sizes of each output tensor along the axis. If a number then it must evenly divide `x.shape[axis]`; otherwise the sum of sizes must match `x.shape[axis]`.

The dimension along which to split. Defaults to 0 (the first dimension).

Tensors, **Slicing and Joining**

```

function split<T extends Tensor>(x: Tensor|TensorLike, numOrSizeSplits: number[]|number, axis = 0): T[] {
  const $x = convertToTensor(x, 'x', 'split');
  const inputs: SplitVInputs = {x: $x};
  const attr: SplitVAttrs = {numOrSizeSplits, axis};
  return ENGINE.runKernel(SplitV, inputs as {} as NamedTensorMap, attr as {} as NamedAttrMap) as T[];
}
export const split = op({split});

```

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```

=====
import {Tensor} from '../tensor';
import {assert} from '../util';
import {complex} from '../complex';
import {concat} from '../concat';
import {imag} from '../imag';
import {op} from '../operation';
import {real} from '../real';
import {reshape} from '../reshape';
import {slice} from '../slice';
import {split} from '../split';
import {zeros} from '../zeros';
import {zerosLike} from '../zeros_like';
import {fft} from './fft';

Real value input fast Fourier transform. Computes the 1-dimensional discrete Fourier transform over the inner-most dimension of the real input.

const real = tf.tensor1d([1, 2, 3]);
real.rfft().print();

@param input The real value input to compute an rfft over.
@doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}

rfft_(input: Tensor, fftLength?: number): Tensor {
  assert(input.dtype === 'float32', () => `The dtype for rfft() must be real value but got ${input.dtype}`);
  let innerDimensionSize = input.shape[input.shape.length - 1];
  const batch = input.size / innerDimensionSize;
  let adjustedInput: Tensor;
  if (fftLength != null && fftLength < innerDimensionSize) {
    // Need to crop
    const begin = input.shape.map(v => 0);
    const size = input.shape.map(v => v);
    size[input.shape.length - 1] = fftLength;
    adjustedInput = slice(input, begin, size);
    innerDimensionSize = fftLength;
  } else if (fftLength != null && fftLength > innerDimensionSize) {
    // Need to pad with zeros
    const zerosShape = input.shape.map(v => v);
    zerosShape[input.shape.length - 1] = fftLength - innerDimensionSize;
    adjustedInput = concat([input, zeros(zerosShape)], input.shape.length - 1);
    innerDimensionSize = fftLength;
  } else {
    adjustedInput = input;
  }
  // Complement the input with zero imaginary numbers
  const zerosInput = zerosLike(adjustedInput);
  const complexInput = reshape(complex(adjustedInput, zerosInput), [batch, innerDimensionSize]);
  const ret = fft(complexInput);
  // Exclude complex conjugations. These conjugations are put symmetrically
  const half = Math.floor(innerDimensionSize / 2) + 1;
  const realValues = real(ret);
  const imagValues = imag(ret);
  const realComplexConjugate = split(realValues, [half, innerDimensionSize - half], realValues.shape.length - 1);
  const imagComplexConjugate = split(imagValues, [half, innerDimensionSize - half], imagValues.shape.length - 1);
  const outputShape = adjustedInput.shape.slice();
  outputShape[adjustedInput.shape.length - 1] = half;
  return reshape(complex(realComplexConjugate[0], imagComplexConjugate[0]), outputShape);
}
export const rfft = op({rfft});

```

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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Sqrt, SqrtInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes square root of the input `tf.Tensor` element-wise: `y = sqrt(x)`\n *\n * const x = tf.tensor1d([1, 2, 4, -1]);\n *\n * x.sqrt().print(); // or tf.sqrt(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction sqrt_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'sqrt');\n  const inputs: SqrtInputs = {x: $x};\n  return ENGINE.runKernel(Sqrt, inputs as NamedTensorMap);\n}\n\nexport const sqrt = op({sqrt_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {SquaredDifference, SquaredDifferenceInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns (a - b) * (a - b) element-wise.\n * Supports broadcasting.\n *\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2, 9, 4]);\n * a.squaredDifference(b).print(); // or\n * tf.squaredDifference(a, b)\n *\n * // Broadcast squared difference a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n * a.squaredDifference(b).print(); // or\n * tf.squaredDifference(a, b)\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction squaredDifference_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let $a = convertToTensor(a, 'a', 'squaredDifference');\n  let $b = convertToTensor(b, 'b', 'squaredDifference');\n  [$a, $b] = makeTypesMatch($a, $b);\n  assertAndGetBroadcastShape($a.shape, $b.shape);\n  const inputs: SquaredDifferenceInputs = {a: $a, b: $b};\n  const attrs = {};\n  return ENGINE.runKernel(SquaredDifference, inputs as unknown as NamedTensorMap, attrs);\n}\n\nexport const squaredDifference = op({squaredDifference_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {squeezeShape} from './util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Removes dimensions of size 1 from the shape of a `tf.Tensor`.\n *\n * const x = tf.tensor([1, 2, 3, 4], [1, 1, 4]);\n * x.squeeze().print();\n *\n * @param x The input tensor to be squeezed.\n * @param axis An optional list of numbers. If specified, only squeezes the dimensions listed. The dimension index starts at 0. It is an error to squeeze a dimension that is not 1.\n *\n * @doc {heading: 'Tensors',
```

```

subheading: 'Transformations')\n *\nfunction squeeze_<T extends Tensor>(x: Tensor|TensorLike, axis?: number[]):
T {\n  const $x = convertToTensor(x, 'x', 'squeeze');\n  return reshape($x, squeezeShape($x.shape, axis).newShape)
as T;\n}\n\nexport const squeeze = op({squeeze_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Pack, PackAttrs, PackInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensorArray} from './tensor_util_env';\nimport {TensorLike} from
 './types';\nimport * as util from './util';\nimport {op} from './operation';\n\n/**\n * Stacks a list of rank-`R`
`tf.Tensor`s into one rank-`(R+1)` `tf.Tensor`.\n *\n * ``js\n * const a = tf.tensor1d([1, 2]);\n * const b =
tf.tensor1d([3, 4]);\n * const c = tf.tensor1d([5, 6]);\n * tf.stack([a, b, c]).print();\n * ```\n *\n * @param tensors A
list of tensor objects with the same shape and dtype.\n * @param axis The axis to stack along. Defaults to 0 (the first
dim).\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n *\nfunction stack_<T extends
Tensor>(\n  tensors: Array<T|TensorLike>, axis = 0): Tensor {\n  const $tensors = \n
convertToTensorArray(tensors, 'tensors', 'stack', 'string_or_numeric');\n\n  util.assert(\n    $tensors.length >= 1, ()
=> 'Pass at least one tensor to tf.stack');\n\n  if ($tensors.length > 0) {\n    util.assert(\n      axis <= $tensors[0].rank,
() => 'Axis must be <= rank of the tensor');\n  }\n\n  const inputs: PackInputs = $tensors;\n  const attrs: PackAttrs =
{axis};\n\n  return ENGINE.runKernel(\n    Pack, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\nexport const stack = op({stack_});\n", "/*\n * @license\n * Copyright 2018 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Step, StepAttrs, StepInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Computes step of the input `tf.Tensor` element-wise: `x > 0 ?
1 : alpha * x`\n *\n * ``js\n * const x = tf.tensor1d([0, 2, -1, -3]);\n * x.step(.5).print(); // or tf.step(x, .5)\n *
```\n *\n * @param x The input tensor.\n * @param alpha The gradient when input is negative.\n *\n * @doc {heading:
'Operations', subheading: 'Basic math'}\n *\nfunction step_<T extends Tensor>(x: T|TensorLike, alpha = 0.0): T {\n
const $x = convertToTensor(x, 'x', 'step');\n\n const inputs: StepInputs = {x: $x};\n const attrs: StepAttrs =
{alpha};\n\n return ENGINE.runKernel(\n Step, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\nexport const step = op({step_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====

```

```

*\n\nimport {ENGINE} from './engine';\nimport {StridedSlice, StridedSliceAttrs, StridedSliceInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
 {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Extracts a strided slice of a tensor.\n *\n * Roughly speaking, this op extracts a slice of size (end-begin)/stride from\n * the given input tensor (x). Starting at
 the location specified by begin the\n * slice continues by adding stride to the index until all dimensions are not\n *
 less than end. Note that a stride can be negative, which causes a reverse\n * slice.\n *\n *`js\n * const t =
 tf.tensor3d([1, 1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4, 5, 5, 5, 6, 6, 6],\n * [3, 2, 3]);\n * t.stridedSlice([1, 0, 0], [2, 1, 3], [1, 1,
 1]).print() // [[[3, 3, 3]]]\n * t.stridedSlice([1, 0, 0], [2, 2, 3], [1, 1, 1]).print() // [[[3, 3, 3],\n *
 [4, 4, 4]]]\n * t.stridedSlice([1, -1, 0], [2, -3, 3], [1, -1, 1]).print() // [[[4, 4, 4],\n *
 [3, 3, 3]]]\n *`*\n *\n * @param x The tensor to stride slice.\n *\n * @param begin The coordinates to start
 the slice from.\n *\n * @param end: The coordinates to end the slice at.\n *\n * @param strides: The size of the slice.\n *\n
 * @param beginMask: If the ith bit of beginMask is set, begin[i] is ignored\n * and the fullest possible range in
 that dimension is used instead.\n *\n * @param endMask: If the ith bit of endMask is set, end[i] is ignored\n * and
 the fullest possible range in that dimension is used instead.\n *\n * @param shrinkAxisMask: a bitmask where bit i
 implies that\n * the ith specification should shrink the dimensionality. begin and end must\n * imply a slice of size 1
 in the dimension.\n *\n * @doc {heading: 'Operations', subheading: 'Slicing and Joining'}\n *\n\nfunction
stridedSlice_(\n x: Tensor|TensorLike, begin: number[], end: number[], strides?: number[],\n beginMask = 0,
 endMask = 0, ellipsisMask = 0, newAxisMask = 0,\n shrinkAxisMask = 0): Tensor {\n const $x =
 convertToTensor(x, 'x', 'stridedSlice');\n const inputs: StridedSliceInputs = {x: $x};\n const attrs:
 StridedSliceAttrs = {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n
 newAxisMask,\n shrinkAxisMask\n };\n return ENGINE.runKernel(\n StridedSlice, inputs as {} as
 NamedTensorMap,\n attrs as {} as NamedAttrMap);\n }\n \n export const stridedSlice =
 op({stridedSlice_});\n }, "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
 under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
 Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
 =====\n
*\n\nimport {ENGINE} from './engine';\nimport {Tan, TanInputs} from './kernel_names';\nimport {Tensor} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
 tan of the input `tf.Tensor` element-wise, `tan(x)`\n *\n *`js\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3 /
 4]);\n * x.tan().print(); // or tf.tan(x)\n *`*\n *\n * @param x The input tensor.\n *\n * @doc {heading:
 'Operations', subheading: 'Basic math'}\n *\n\nfunction tan_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
 convertToTensor(x, 'x', 'tan');\n const inputs: TanInputs = {x: $x};\n return ENGINE.runKernel(Tan, inputs as
 {} as NamedTensorMap);\n }\n \n export const tan = op({tan_});\n }, "/**\n * @license\n * Copyright 2018 Google LLC.
 All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
 file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
 =====\n
*\n\nimport {Tensor1D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike1D}
 from './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor}

```

```

from './tensor_ops_util';\n\n/**\n * Creates rank-1 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor1d` as it makes the code more readable.\n *\n * ```js\n * tf.tensor1d([1, 2, 3]).print();\n * ```\n *\n * @param values The values of the tensor. Can be array of numbers,\n * or a `TypedArray`.\n *\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor1d(values: TensorLike1D, dtype?:\n DataType): Tensor1D {\n assertNonNull(values);\n const inferredShape = inferShape(values, dtype);\n if\n (inferredShape.length !== 1) {\n throw new Error('tensor1d() requires values to be a flat/TypedArray');\n }\n const shape: number[] = null;\n return makeTensor(values, shape, inferredShape, dtype) as Tensor1D;\n}\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n\n*\n\nimport {Tensor2D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike2D}\n from './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor}\n from './tensor_ops_util';\n\n/**\n * Creates rank-2 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor2d` as it makes the code more readable.\n *\n * ```js\n * // Pass a nested array.\n * tf.tensor2d([[1, 2], [3, 4]]).print();\n * ```\n *\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor2d([1, 2, 3, 4], [2, 2]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n *\n * @param shape The shape of the tensor. If not provided, it is inferred from\n * `values`.\n *\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor2d(\n values: TensorLike2D, shape?: [number, number],\n dtype?: DataType): Tensor2D {\n assertNonNull(values);\n if\n (shape != null && shape.length !== 2) {\n throw new Error('tensor2d() requires shape to have two numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 2 && inferredShape.length !==\n 1) {\n throw new Error(\n 'tensor2d() requires values to be number[][] or flat/TypedArray');\n }\n if\n (inferredShape.length === 1 && shape == null) {\n throw new Error(\n 'tensor2d() requires shape to be provided when `values` '+\n 'are a flat/TypedArray');\n }\n return makeTensor(values, shape, inferredShape,\n dtype) as Tensor2D;\n}\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n\n*\n\nimport {Tensor4D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike4D}\n from './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor}\n from './tensor_ops_util';\n\n/**\n * Creates rank-4 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor4d` as it makes the code more readable.\n *\n * ```js\n * // Pass a nested array.\n * tf.tensor4d([[[[1], [2]], [[3], [4]]]]).print();\n * ```\n *\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor4d([1, 2, 3, 4], [1, 2, 2, 1]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n *\n * @param shape The shape of the tensor. Optional. If not provided,\n * it is inferred from `values`.\n *\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor4d(\n values: TensorLike4D, shape?: [number, number, number, number],\n dtype?: DataType): Tensor4D {\n

```

```

assertNonNull(values);\n if (shape != null && shape.length !== 4) {\n throw new Error('tensor4d() requires shape
to have four numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 4
&& inferredShape.length !== 1) {\n throw new Error(\n 'tensor4d() requires values to be number[][][] or
flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n throw new Error(\n
'tensor4d() requires shape to be provided when `values` '+\n 'are a flat array');\n }\n return makeTensor(values,
shape, inferredShape, dtype) as Tensor4D;\n}\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {Tensor5D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike5D}
from '../types';\nimport {DataType} from '../types';\nimport {assertNonNull} from '../util';\nimport {makeTensor}
from '../tensor_ops_util';\n\n/**\n * Creates rank-5 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The
same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor5d` as it makes
the code more readable.\n *\n * ``js\n * // Pass a nested array.\n *\n * tf.tensor5d([[[[1],[2]],[3],[4]],[[5],[6]],[7],[8]]]).print();\n *\n * // Pass a flat array and specify a
shape.\n * tf.tensor5d([1, 2, 3, 4, 5, 6, 7, 8], [1, 2, 2, 2, 1]).print();\n *\n * @param values The values of the
tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n * @param shape The shape of the
tensor. Optional. If not provided,\n * it is inferred from `values`.\n * @param dtype The data type.\n *\n * @doc
{heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor5d(\n values: TensorLike5D, shape?:
[number, number, number, number, number],\n dtype?: DataType): Tensor5D {\n assertNonNull(values);\n if
(shape != null && shape.length !== 5) {\n throw new Error('tensor5d() requires shape to have five numbers');\n
 }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 5 && inferredShape.length !==
1) {\n throw new Error(\n 'tensor5d() requires values to be '+\n 'number[][][] or flat/TypedArray');\n
 }\n if (inferredShape.length === 1 && shape == null) {\n throw new Error(\n 'tensor5d() requires shape to be
provided when `values` '+\n 'are a flat array');\n }\n return makeTensor(values, shape, inferredShape, dtype) as
Tensor5D;\n}\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\n\nimport {Tensor6D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike6D}
from '../types';\nimport {DataType} from '../types';\nimport {assertNonNull} from '../util';\nimport {makeTensor}
from '../tensor_ops_util';\n\n/**\n * Creates rank-6 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The
same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor6d` as it makes
the code more readable.\n *\n * ``js\n * // Pass a nested array.\n *\n * tf.tensor6d([[[[1],[2]],[3],[4]],[[5],[6]],[7],[8]]]).print();\n *\n * // Pass a flat array and specify a
shape.\n * tf.tensor6d([1, 2, 3, 4, 5, 6, 7, 8], [1, 1, 2, 2, 2, 1]).print();\n *\n * @param values The values of the
tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n * @param shape The shape of the
tensor. Optional. If not provided,\n * it is inferred from `values`.\n * @param dtype The data type.\n *\n * @doc
{heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor6d(\n values: TensorLike6D,\n shape?:
[number, number, number, number, number, number],\n dtype?: DataType): Tensor6D {\n

```

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assertNonNull(values);\n if (shape != null && shape.length !== 6) {\n throw new Error('tensor6d() requires shape
to have six numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 6 &&
inferredShape.length !== 1) {\n throw new Error(\n 'tensor6d() requires values to be number[][][] or '+\n 'flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n throw new Error(\n 'tensor6d() requires shape to be provided when `values` '+\n 'are a flat array');\n }\n shape = shape ||\n inferredShape as [number, number, number, number, number, number];\n return makeTensor(values, shape,
inferredShape, dtype) as Tensor6D;\n}\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\n\nimport {ENGINE} from './engine';\nimport {TopK, TopKAttrs, TopKInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
'./tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
'./types';\n\nimport {op} from './operation';\n\n/**\n * Finds the values and indices of the `k` largest entries along
the last\n * dimension.\n * If the input is a vector (rank=1), finds the k largest entries in the vector\n * and
outputs their values and indices as vectors. Thus values[j] is the j-th\n * largest entry in input, and its index is
indices[j].\n * For higher rank inputs, computes the top k entries along the last dimension.\n * If two elements
are equal, the lower-index element appears first.\n * `const a = tf.tensor2d([[1, 5], [4, 3]]);\n * const
{values, indices} = tf.topk(a);\n * values.print();\n * indices.print();\n * ``\n * @param x 1-D or higher `tf.Tensor`
with last dimension being at least `k`.\n * @param k Number of top elements to look for along the last dimension.\n
* @param sorted If true, the resulting `k` elements will be sorted by the\n * values in descending order.\n *
*\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n */\nfunction topk_<T extends Tensor>(\n x:
T|TensorLike, k = 1, sorted = true): {values: T, indices: T} {\n const $x = convertToTensor(x, 'x', 'topk');\n if
($x.rank === 0) {\n throw new Error('topk() expects the input to be of rank 1 or higher');\n }\n const lastDim =
$x.shape[$x.shape.length - 1];\n if (k > lastDim) {\n throw new Error(\n `k` passed to topk() must be <= the
last dimension (${lastDim}) `+\n `but got ${k}`);\n }\n const inputs: TopKInputs = {x: $x};\n const attrs:
TopKAttrs = {k, sorted};\n const [values, indices] = ENGINE.runKernel(\n TopK, inputs as { } as
NamedTensorMap, attrs as { } as NamedAttrMap);\n return {values, indices} as {values: T, indices:
T};\n}\n\nexport const topk = op({topk_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {Tensor} from './tensor';\nimport {DataType, Rank, ShapeMap} from './types';\nimport {buffer}
from './buffer';\nimport {op} from './operation';\nimport {MPRandGauss} from './rand_util';\n\n/**\n * Creates a
`tf.Tensor` with values sampled from a truncated normal\n * distribution.\n * `tf.truncatedNormal([2,
2]).print();\n * ``\n * The generated values follow a normal distribution with specified mean and\n * standard
deviation, except that values whose magnitude is more than 2\n * standard deviations from the mean are dropped
and re-picked.\n * @param shape An array of integers defining the output tensor shape.\n * @param mean The
mean of the normal distribution.\n * @param stdDev The standard deviation of the normal distribution.\n * @param
dtype The data type of the output tensor.\n * @param seed The seed for the random number generator.\n *
*\n * @doc

```



```
{heading: 'Tensors', subheading: 'Creation'}\n *^\nfunction truncatedNormal_<R extends Rank>(\n shape: ShapeMap[R], mean = 0, stdDev = 1, dtype?: 'float32'|'int32',\n seed?: number): Tensor<R> {\n if (dtype != null && (dtype as DataType) === 'bool') {\n throw new Error('Unsupported data type $ { dtype }');\n }\n const randGauss =\n new MPRandGauss(mean, stdDev, dtype, true /* truncated */, seed);\n const res = buffer(shape, dtype);\n for (let i = 0; i < res.values.length; i++) {\n res.values[i] = randGauss.nextValue();\n }\n return res.toTensor();\n}\n\nexport const truncatedNormal = op({truncatedNormal_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {Unique, UniqueAttrs, UniqueInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor, Tensor1D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assert} from './util';\nimport {op} from './operation';\n\n/**\n * Finds unique elements along an axis of a tensor.\n * It returns a tensor `values` containing all of the unique elements along the `axis` of the given tensor `x` in the same order that they occur along the `axis` in `x`; `x` does not need to be sorted. It also returns a tensor `indices` the same size as the number of the elements in `x` along the `axis` dimension. It contains the index in the unique output `values`.\n * A 1-D tensor\n * const a = tf.tensor1d([1, 1, 2, 4, 4, 4, 7, 8, 8]);\n * const {values, indices} = tf.unique(a);\n * values.print(); // [1, 2, 4, 7, 8, 8]\n * indices.print(); // [0, 0, 1, 2, 2, 3, 4, 4]\n * A 2-D tensor with axis=0\n * /\n * 'a' is: [[1, 0, 0], [1, 0, 0], [2, 0, 0]]\n * const a = tf.tensor2d([[1, 0, 0], [1, 0, 0], [2, 0, 0]]);\n * const {values, indices} = tf.unique(a, 0);\n * values.print(); // [[1, 0, 0], [2, 0, 0]]\n * indices.print(); // [0, 0, 1]\n * A 2-D tensor with axis=1\n * /\n * 'a' is: [[1, 0, 0], [1, 0, 0], [2, 0, 0]]\n * const a = tf.tensor2d([[1, 0, 0], [1, 0, 0], [2, 0, 0]]);\n * const {values, indices} = tf.unique(a, 1);\n * values.print(); // [[1, 0], [1, 0], [2, 0]]\n * indices.print(); // [0, 1, 1]\n * @param x A tensor (int32, string, bool).\n * @param axis The axis of the tensor to find the unique elements.\n * @returns [uniqueElements, indices] (see above for details)\n *\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n *^\nfunction unique_<T extends Tensor>(\n x: T|TensorLike, axis = 0): {values: T, indices: Tensor1D} {\n const $x = convertToTensor(x, 'x', 'unique', 'string_or_numeric');\n assert($x.rank > 0, () => 'The input tensor must be at least 1D');\n const inputs: UniqueInputs = {x: $x};\n const attrs: UniqueAttrs = {axis};\n const [values, indices] = ENGINE.runKernel(\n Unique, inputs as { } as NamedTensorMap,\n attrs as { } as NamedAttrMap) as [T, Tensor1D];\n return {values, indices};\n}\n\nexport const unique = op({unique_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {UnsortedSegmentSum, UnsortedSegmentSumAttrs, UnsortedSegmentSumInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor, Tensor1D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assert, isInt} from './util';\nimport {op} from './operation';\n\n/**\n * Computes the sum along segments of a `tf.Tensor`.\n *
```

```

```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * const segmentIds = tf.tensor1d([1, 2, 0, 1], 'int32');\n * const
numSegments = 3;\n * \n * x.unsortedSegmentSum(segmentIds, numSegments).print()\n * //or
tf.unsortedSegmentSum(x, segmentIds, numSegments)\n * ```\n * @param x The `tf.Tensor` that will be summed
along its segments.\n * @param segmentIds A `tf.Tensor1D` whose rank is equal to the rank of `x`\n * dimension
along the `axis`. Maps each element of `x` to a segment.\n * @param numSegments The number of distinct
`segmentIds`.\n * \n * @doc {heading: 'Operations', subheading: 'Segment'}\n * \nfunction
unsortedSegmentSum<T extends Tensor>(\n  x: T|TensorLike, segmentIds: Tensor1D|TensorLike, numSegments:
number): T {\n  const $x = convertToTensor(x, 'x', 'unsortedSegmentSum');\n  const $segmentIds =\n  convertToTensor(segmentIds, 'segmentIds', 'unsortedSegmentSum', 'int32');\n  assert(isInt(numSegments), () =>
'numSegments must be of dtype int');\n  \n  const inputs: UnsortedSegmentSumInputs = {x: $x, segmentIds:
$segmentIds};\n  const attrs: UnsortedSegmentSumAttrs = {numSegments};\n  \n  return ENGINE.runKernel(\n
UnsortedSegmentSum, inputs as {} as NamedTensorMap,\n  attrs as {} as NamedAttrMap);\n  \n}\n\nexport const
unsortedSegmentSum = op({unsortedSegmentSum_});\n", "/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Unpack, UnpackAttrs, UnpackInputs} from
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Unstacks a
`tf.Tensor` of rank-`R` into a list of rank-`(R-1)` `tf.Tensor`s.\n * \n * ```js\n * const a = tf.tensor2d([1, 2, 3, 4], [2,
2]);\n * \n * tf.unstack(a).forEach(tensor => tensor.print());\n * ```\n * \n * @param x A tensor object.\n * @param
axis The axis to unstack along. Defaults to 0 (the first dim).\n * \n * @doc {heading: 'Tensors', subheading: 'Slicing
and Joining'}\n * \nfunction unstack_(x: Tensor|TensorLike, axis = 0): Tensor[] {\n  const $x = convertToTensor(x,
'x', 'unstack', 'string_or_numeric');\n  util.assert(\n    axis >= -$x.shape.length && axis < $x.shape.length,\n    ()
=>`\n    `Axis = ${axis} is not in [-${$x.shape.length}, ${$x.shape.length}]);\n  \n  const inputs: UnpackInputs =
{value: $x};\n  const attrs: UnpackAttrs = {axis};\n  \n  return ENGINE.runKernel(\n    Unpack, inputs as {} as
NamedTensorMap, attrs as {} as NamedAttrMap);\n  \n}\n\nexport const unstack = op({unstack_});\n", "/**\n *
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copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Tensor, Variable} from './tensor';\nimport {DataType, Rank}
from './types';\n\n/**\n * Creates a new variable with the provided initial value.\n * \n * ```js\n * const x =
tf.variable(tf.tensor([1, 2, 3]));\n * x.assign(tf.tensor([4, 5, 6]));\n * \n * x.print();\n * ```\n * \n * @param initialValue
Initial value for the tensor.\n * @param trainable If true, optimizers are allowed to update it.\n * @param name
Name of the variable. Defaults to a unique id.\n * @param dtype If set, initialValue will be converted to the given
type.\n * \n * @doc {heading: 'Tensors', subheading: 'Creation'}\n * \nfunction variable<R extends Rank>(\n
initialValue: Tensor<R>, trainable = true, name?: string,\n  dtype?: DataType): Variable<R> {\n  return
ENGINE.makeVariable(initialValue, trainable, name, dtype) as\n  Variable<R>;\n  \n}\n", "/**\n * @license\n *
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```
=====\n *\n */\n /**\n  * An implementation of the Where kernel shared between cpu and webgl\n  */\n\nimport {buffer} from './ops/buffer';\nimport {Tensor2D} from './tensor';\nimport {TypedArray} from './types';\n\nexport function whereImpl(condShape: number[], condVals: TypedArray): Tensor2D {\n  const indices = [];\n  for (let i = 0; i < condVals.length; i++) {\n    if (condVals[i]) {\n      indices.push(i);\n    }\n  }\n  const inBuffer = buffer(condShape, 'int32');\n  const out = buffer([indices.length, condShape.length], 'int32');\n  for (let i = 0; i < indices.length; i++) {\n    const loc = inBuffer.indexToLoc(indices[i]);\n    const offset = i * condShape.length;\n    out.values.set(loc, offset);\n  }\n  return out.toTensor() as Tensor2D;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```
=====\n *\n */\n\nimport {whereImpl} from './backends/where_impl';\nimport {Tensor, Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\n/**\n * Returns the coordinates of true elements of condition.\n * The coordinates are returned in a 2-D tensor where the first dimension (rows)\n * represents the number of true elements, and the second dimension (columns)\n * represents the coordinates of the true elements. Keep in mind, the shape of\n * the output tensor can vary depending on how many true values there are in\n * input. Indices are output in row-major order. The resulting tensor has the\n * shape [numTrueElements, condition.rank].\n * This is analogous to calling the python `tf.where(cond)` without an x or y.\n * `js`\n * const cond = tf.tensor1d([false, false, true], 'bool');\n * const result = await tf.whereAsync(cond);\n * result.print();\n * ``\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\n\nexport function whereAsync_(condition: Tensor|TensorLike): Promise<Tensor2D> {\n  const $condition = convertToTensor(condition, 'condition', 'whereAsync', 'bool');\n  const vals = await $condition.data();\n  const res = whereImpl($condition.shape, vals);\n  if (condition !== $condition) {\n    $condition.dispose();\n  }\n  return res;\n}\n\nexport const whereAsync = whereAsync_;\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```
=====\n *\n */\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {gather} from './gather';\nimport {reshape} from './reshape';\nimport {squeeze} from './squeeze';\nimport {whereAsync} from './where_async';\n\n/**\n * Apply boolean mask to tensor.\n * `js`\n * const tensor = tf.tensor2d([1, 2, 3, 4, 5, 6], [3, 2]);\n * const mask = tf.tensor1d([1, 0, 1], 'bool');\n * const result = await tf.booleanMaskAsync(tensor, mask);\n * result.print();\n * ``\n * @param tensor N-D tensor.\n * @param mask K-D boolean tensor, K <= N and K must be known statically.\n * @param axis A 0-D int Tensor representing the axis in tensor to mask from.\n * By default, axis is 0 which will mask from the first dimension.\n * Otherwise K + axis <= N.\n * @doc {heading: 'Tensors', subheading:
```



```

} \n if (p === Infinity) {\n return max(abs(x), axis);\n } \n if (p === -Infinity) {\n return min(abs(x),
axis);\n } \n if (p === 'euclidean' || p === 2) {\n // norm(x, 2) = sum(abs(xi) ^ 2) ^ 1/2\n return
sqrt(sum(pow(abs(x), scalar(2, 'int32')), axis));\n } \n \n throw new Error(`Error in norm: invalid ord value:
${p}`);\n } \n \n // matrix (assumption axis[0] < axis[1])\n if (Array.isArray(axis) && axis.length === 2) {\n if (p
=== 1) {\n return max(sum(abs(x), axis[0]), axis[1] - 1);\n } \n if (p === Infinity) {\n return
max(sum(abs(x), axis[1]), axis[0]);\n } \n if (p === -Infinity) {\n return min(sum(abs(x), axis[1]), axis[0]);\n
} \n if (p === 'fro' || p === 'euclidean') {\n // norm(x) = sqrt(sum(pow(x, 2)))\n return sqrt(sum(square(x),
axis));\n } \n \n throw new Error(`Error in norm: invalid ord value: ${p}`);\n } \n \n throw new Error(`Error in
norm: invalid axis: ${axis}`);\n } \n \n export const norm = op({norm_});\n } \n \n /**\n * @license\n * Copyright 2018
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may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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===== \n
*\n\nimport {Scalar, Tensor} from './tensor';\nimport {assertTypesMatch} from './tensor_util';\nimport
{convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from
'./util';\n\nimport {add} from './add';\nimport {div} from './div';\nimport {mul} from './mul';\nimport {op} from
'./operation';\nimport {pow} from './pow';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\n\n**\n *
Compute the moving average of a variable.\n * \n * Without zeroDebias, the moving average operation is defined
by:\n *  $v += \delta$ \n * where\n *  $\delta = (1 - \text{decay}) * (x - v)$ \n * \n * With zeroDebias (default), the  $\delta$  term
is scaled to debias the\n * effect of the (assumed) zero-initialization of  $v$ .\n *  $\delta /= (1 - \text{decay} ^ \text{step})$ \n * \n *
For more details on the zero-debiasing algorithm, see:\n * https://arxiv.org/abs/1412.6980\n * \n * Note that this
function is completely stateless and does not keep track of\n * step count. The step count needs to be maintained by
the caller and passed\n * in as step`.\n * \n * @param v The current moving average value.\n * @param x New
input value, must have the same shape and dtype as  $v$ .\n * @param decay The decay factor. Typical values are
0.95 and 0.99.\n * @param step Step count.\n * @param zeroDebias: Whether zeroDebias is to be performed
(default: `true`).\n * @returns The new moving average value.\n * \n * @doc {heading: 'Operations', subheading:
'Moving Average'}\n * \n function movingAverage_<T extends Tensor>(\n v: T|TensorLike, x: T|TensorLike,
decay: number|Scalar,\n step?: number|Scalar, zeroDebias = true): T {\n const $v = convertToTensor(v, 'v',
'movingAverage');\n const $x = convertToTensor(x, 'x', 'movingAverage');\n const $decay =
convertToTensor(decay, 'decay', 'movingAverage');\n \n assertTypesMatch($v, $x);\n util.assert(\n
util.arraysEqual($v.shape, $x.shape), () => 'Shape mismatch in v and x');\n \n const one = scalar(1);\n const
oneMinusDecay = sub(one, $decay);\n \n let update = mul(sub($x, $v), oneMinusDecay);\n if (zeroDebias) {\n
util.assert(\n step != null, () => 'When using zeroDebias: true, step is required.);\n \n const $step =
convertToTensor(step, 'step', 'movingAverage');\n update = div(update, sub(one, pow($decay, $step)));\n }\n
return add($v, update);\n }\n\nexport const movingAverage = op({movingAverage_});\n } \n \n /**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

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===== \n
*\n\nimport {ENGINE} from './engine';\nimport {ScatterNd, ScatterNdAttrs, ScatterNdInputs} from
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {Rank,

```

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ShapeMap, TensorLike} from './types';\n\nimport {op} from './operation';\nimport * as scatter_nd_util from
 './scatter_nd_util';\n\n/**\n * Creates a new tensor by applying sparse updates to individual\n * values or slices
 within a zero tensor of the given shape tensor according to\n * indices. This operator is the inverse of the
 `tf.gatherND` operator which\n * extracts values or slices from a given tensor.\n * \n * const indices =
 tf.tensor2d([4, 3, 1, 7], [4, 1], 'int32');\n * const updates = tf.tensor1d([9, 10, 11, 12]);\n * const shape = [8];\n *
 tf.scatterND(indices, updates, shape).print() // [0, 11, 0, 10, 9, 0, 0, 12]\n * \n * @param indices The tensor
 contains the indices into the output tensor.\n * @param updates The tensor contains the value for the indices.\n *
 @param shape: The shape of the output tensor.\n * @doc {heading: 'Operations', subheading: 'Slicing and
 Joining'}\n */\nfunction scatterND<R extends Rank>(\n  indices: Tensor|TensorLike, updates:
 Tensor|TensorLike,\n  shape: ShapeMap[R]): Tensor<R> {\n  const $indices = convertToTensor(indices, 'indices',
 'scatterND', 'int32');\n  const $updates = convertToTensor(updates, 'updates', 'scatterND');\n
 scatter_nd_util.validateInput($updates, $indices, shape);\n  const inputs: ScatterNdInputs = {indices: $indices,
 updates: $updates};\n  const attrs: ScatterNdAttrs = {shape};\n  // tslint:disable-next-line: no-unnecessary-type-
assertion\n  return ENGINE.runKernel(\n    ScatterNd, inputs as {} as NamedTensorMap,\n    attrs as {}
 as NamedAttrMap) as Tensor<R>;\n}\n\nexport const scatterND = op({scatterND_});\n\n", "/*\n * @license\n *
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 \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Tensor} from './tensor';\n\n/**\n * Validate sparseToDense inputs.\n * \n * @param sparseIndices A 0-
D, 1-D, or 2-D Tensor of type int32.\n * sparseIndices[i] contains the complete index where sparseValues[i] will
 be\n * placed.\n * @param sparseValues A 0-D or 1-D Tensor. Values\n * corresponding to each row of
 sparseIndices, or a scalar value to be used for\n * all sparse indices.\n * @param outputShape number[]. Shape of
 the dense output tensor.\n * @param validateIndices boolean. indice validation is not supported, error\n * will be
 thrown if it is set.\n */\nexport function validateInput(\n  sparseIndices: Tensor, sparseValues: Tensor,
 outputShape: number[],\n  defaultValues: Tensor) {\n  if (sparseIndices.dtype !== 'int32') {\n    throw new Error(\n
      'tf.sparseToDense() expects the indices to be int32 type,' +\n      ` but the dtype was ${sparseIndices.dtype}.`);\n
  }\n  if (sparseIndices.rank > 2) {\n    throw new Error(\n      'sparseIndices should be a scalar, vector, or matrix,' +\n
      ` but got shape ${sparseIndices.shape}.`);\n  }\n  const numElems = sparseIndices.rank > 0 ?
 sparseIndices.shape[0] : 1;\n  const numDims = sparseIndices.rank > 1 ? sparseIndices.shape[1] : 1;\n  if
 (outputShape.length !== numDims) {\n    throw new Error(\n      'outputShape has incorrect number of elements:,'\n
      +\n      ` ${outputShape.length}, should be: ${numDims}.`);\n  }\n  const numValues = sparseValues.size;\n  if
 (! (sparseValues.rank === 0 ||\n    sparseValues.rank === 1 && numValues === numElems)) {\n    throw new
 Error(\n      'sparseValues has incorrect shape ' +\n      ` ${sparseValues.shape}, should be [] or
 [${numElems}]`);\n  }\n  if (sparseValues.dtype !== defaultValues.dtype) {\n    throw new
 Error('sparseValues.dtype must match defaultValues.dtype');\n  }\n}\n\n", "/*\n * @license\n *
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 \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {ENGINE} from './engine';\nimport {SparseToDense, SparseToDenseAttrs, SparseToDenseInputs}
 from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport * as sparse_to_dense from

```



```
Tensor|TensorLike, indices: Tensor|TensorLike): Tensor {\n  const $indices = convertToTensor(indices, 'indices',\n  'gatherND', 'int32');\n  const $x = convertToTensor(x, 'x', 'gatherND');\n  const inputs: GatherNdInputs = {params:\n  $x, indices: $indices};\n  return ENGINE.runKernel(GatherNd, inputs as {} as NamedTensorMap);\n}\n\nexport\nconst gatherND = op({gatherND_});\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n */\nimport {Tensor} from './tensor';\nimport * as util from './util';\n\n/**\n * Normalize noise shape based on\n * provided tensor and noise shape.\n * @param x Tensor.\n * @param noiseShape The shape for the randomly\n * generated keep/drop flags, as\n * an array of numbers. Optional.\n * @returns Normalized noise shape.\n */\nexport function getNoiseShape(x: Tensor, noiseShape?: number[]): number[] {\n  if (noiseShape == null) {\n    return x.shape.slice();\n  }\n  if (util.arraysEqual(x.shape, noiseShape)) {\n    return noiseShape;\n  }\n  if\n  (x.shape.length === noiseShape.length) {\n    const newDimension: number[] = [];\n    for (let i = 0; i <\n    x.shape.length; i++) {\n      if (noiseShape[i] == null && x.shape[i] != null) {\n        newDimension.push(x.shape[i]);\n      } else {\n        newDimension.push(noiseShape[i]);\n      }\n    }\n    return\n    newDimension;\n  }\n  return noiseShape;\n}\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n */\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}\nfrom './types';\nimport * as util from './util';\nimport {add} from './add';\nimport {div} from './div';\nimport\n{getNoiseShape} from './dropout_util';\nimport {floor} from './floor';\nimport {mul} from './mul';\nimport {op}\nfrom './operation';\nimport {randomUniform} from './random_uniform';\n\n/**\n * Computes dropout.\n * @param x A floating point Tensor or TensorLike.\n * @param rate A float in the range [0, 1). The\n * probability that each element\n * of x is discarded.\n * @param noiseShape An array of numbers of type int32,\n * representing the\n * shape for randomly generated keep/drop flags. If the noiseShape has null\n * value, it will be\n * automatically replaced with the x's relative dimension\n * size. Optional.\n * @param seed Used to create random\n * seeds. Optional.\n * @returns A Tensor of the same shape of x.\n * @doc {heading: 'Operations', subheading:\n * 'Dropout'}\n */\nfunction dropout_(\n  x: Tensor|TensorLike, rate: number, noiseShape?: number[],\n  seed?:\n  number|string): Tensor {\n  const $x = convertToTensor(x, 'x', 'dropout');\n  util.assert(\n    $x.dtype ===\n    'float32',\n    () => `x has to be a floating point tensor since it's going to be ` +\n    ` scaled, but got a\n    ${$x.dtype} tensor instead.`);\n  util.assert(\n    rate >= 0 && rate < 1,\n    () => `rate must be a float in the range\n    [0, 1), but got ${rate}.`);\n  if (rate === 0) {\n    return x instanceof Tensor ? $x.clone() : $x;\n  }\n  const\n  $noiseShape = getNoiseShape($x, noiseShape);\n  const keepProb = 1 - rate;\n  const multiplier = div(\n    floor(add(randomUniform($noiseShape, 0, 1, 'float32', seed),\n    keepProb)),\n    keepProb);\n  return mul($x,\n  multiplier);\n}\n\nexport const dropout = op({dropout_});\n", "/*\n * @license\n * Copyright 2019 Google LLC.\n * All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Tensor1D} from './tensor';\nimport {tensor1d} from './tensor1d';\n\nexport function enclosingPowerOfTwo(value: number) {\n // Return 2**N for integer N such that 2**N >= value.\n return Math.floor(Math.pow(2, Math.ceil(Math.log(value) / Math.log(2.0))));\n}\n\nexport function cosineWindow(\n windowLength: number, a: number, b: number): Tensor1D {\n const even = 1 - windowLength % 2;\n const newValues = new Float32Array(windowLength);\n for (let i = 0; i < windowLength; ++i) {\n const cosArg = (2.0 * Math.PI * i) / (windowLength + even - 1);\n newValues[i] = a - b * Math.cos(cosArg);\n }\n return tensor1d(newValues, 'float32');\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
```

```
\n*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assert, assertShapesMatch, getTypedArrayFromDType} from './util';\nimport {tensor} from './tensor';\n\n/**\n * Returns whether the targets are in the top K predictions.\n * @js\n * const predictions = tf.tensor2d([[20, 10, 40, 30], [30, 50, -20, 10]]);\n * const targets = tf.tensor1d([2, 0]);\n * const precision = await tf.inTopKAsync(predictions, targets);\n * precision.print();\n * @param predictions 2-D or higher `tf.Tensor` with last dimension being\n * at least `k`.\n * @param targets 1-D or higher `tf.Tensor`.\n * @param k Optional Number of top elements to look at for computing precision,\n * default to 1.\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n */\n\n@async function inTopKAsync<T extends Tensor, U extends Tensor>(\n predictions: T|TensorLike, targets: U|TensorLike, k = 1): Promise<U> {\n const $predictions = convertToTensor(predictions, 'predictions', 'inTopK');\n const $targets = convertToTensor(targets, 'targets', 'inTopK');\n\n assert(\n $predictions.rank > 1,\n () => 'inTopK() expects the predictions to be of rank 2 or higher, '\n `but got ${$predictions.rank}`);\n assert(\n $predictions.rank - 1 === $targets.rank,\n () => `predictions rank should be 1 larger than ` +\n `targets rank, but got predictions rank ` +\n `${$predictions.rank} and targets rank ${$targets.rank}`);\n assertShapesMatch(\n $predictions.shape.slice(0, $predictions.shape.length - 1),\n $targets.shape,\n `predictions's shape should be align with the targets' shape, ` +\n `except the last dimension.`);\n const lastDim = $predictions.shape[$predictions.shape.length - 1];\n\n assert(\n k > 0 && k <= lastDim,\n () => `k` passed to inTopK() must be > 0 && <= the predictions last ` +\n `dimension (${lastDim}), but got ${k}`);\n\n const predictionsVals = await $predictions.data();\n const targetsVals = await $targets.data();\n\n // Reshape predictionsVals into a 2d tensor [batch, lastDim]\n // and look up topK along lastDim.\n const [batch, size] = [predictionsVals.length / lastDim, lastDim];\n const precision = getTypedArrayFromDType('bool', batch);\n\n for (let b = 0; b < batch; b++) {\n const offset = b * size;\n const vals = predictionsVals.subarray(offset, offset + size);\n const valAndInd: Array<{value: number, index: number}> = [];\n for (let i = 0; i < vals.length; i++) {\n valAndInd.push({value: vals[i], index: i});\n }\n\n valAndInd.sort((a, b) => b.value - a.value);\n\n precision[b] = 0;\n for (let i = 0; i < k; i++) {\n if (valAndInd[i].index === targetsVals[b]) {\n precision[b] = 1;\n break;\n }\n }\n\n if (predictions !== $predictions) {\n $predictions.dispose();\n }\n if (targets !== $targets) {\n $targets.dispose();\n }\n\n // Output precision has the same shape as targets.\n return tensor(precision, $targets.shape, 'bool') as U;\n}\n\nexport const inTopKAsync = inTopKAsync_;\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n */\n\n
```

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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
\n
*\nimport {ENGINE} from '../engine';\nimport {Conv2DBackpropFilter, Conv2DBackpropFilterAttrs,  
Conv2DBackpropFilterInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport  
{Tensor3D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport * as util from  
../util';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from  
./reshape';\n\n/**\n * Computes the derivative of the filter of a 2D convolution.\n * @param x The input tensor,  
of rank 4 or rank 3 of shape\n * [batch, height, width, inChannels]. If rank 3, batch of 1 is assumed.\n * @param dy The dy image, of rank 4 or rank 3, of shape\n * [batch, height, width, outDepth]. If rank 3, batch of 1 is  
assumed.\n * @param filterShape The shape of the filter, length 4,\n * [filterHeight, filterWidth, inDepth,  
outDepth].\n * @param strides The strides of the convolution: [strideHeight,\n * strideWidth].\n * @param pad A  
string from: 'same', 'valid'. The type of padding algorithm\n * used in the forward prop of the op.\n * @param  
dataFormat: An optional string from: 'NHWC', 'NCHW'. Defaults to\n * 'NHWC'. Specify the data format  
of the input and output data. With the\n * default format 'NHWC', the data is stored in the order of: [batch,\n *  
height, width, channels].\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *  
provided, it will default to truncate.\n */\nfunction conv2DBackpropFilter_<T extends Tensor3D|Tensor4D>(\n  x:  
T, dy: T, filterShape: [number, number, number, number],\n  strides: [number, number][number,\n  pad:  
'valid'|'same'|number|conv_util.ExplicitPadding,\n  dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n  dimRoundingMode?: 'floor'|'round'|'ceil'): Tensor4D {\n  let x4D = x as Tensor4D;\n  if (x.rank === 3) {\n    x4D =  
reshape(x, [1, x.shape[0], x.shape[1], x.shape[2]]);\n  }\n  let dy4D = dy as Tensor4D;\n  if (dy4D.rank === 3) {\n    dy4D =  
reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n  }\n  util.assert(\n    x4D.rank === 4,\n    () =>  
`Error in conv2dDerFilter: input must be rank 4, but got shape `+\n    `${x4D.shape}`);\n  util.assert(\n    dy4D.rank === 4,\n    () => `Error in conv2dDerFilter: dy must be rank 4, but got shape `+\n    `${dy4D.shape}`);\n  util.assert(\n    filterShape.length === 4,\n    () => `Error in conv2dDerFilter: filterShape  
must be length 4, but got `+\n    `${filterShape}`);\n  const inDepth = dataFormat === 'NHWC' ? x4D.shape[3]  
: x4D.shape[1];\n  const outDepth = dataFormat === 'NHWC' ? dy4D.shape[3] : dy4D.shape[1];\n  util.assert(\n    inDepth === filterShape[2],\n    () => `Error in conv2dDerFilter: depth of input ${inDepth}) must `+\n    `match input depth in filter (${filterShape[2]});\n  util.assert(\n    outDepth === filterShape[3],\n    () => `Error  
in conv2dDerFilter: depth of dy (${outDepth}) must `+\n    `match output depth for filter  
(${filterShape[3]});\n  if (dimRoundingMode !== null) {\n    util.assert(\n      util.isInt(pad as number),\n      ()  
=> `Error in conv2dDerFilter: pad must be an integer when using, `+\n      `${dimRoundingMode}`  
but got pad ${pad}`);\n  }\n  const inputs: Conv2DBackpropFilterInputs = {x: x4D, dy:  
dy4D};\n  const attrs: Conv2DBackpropFilterAttrs = {\n    strides, pad, dataFormat, dimRoundingMode,  
filterShape};\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  return ENGINE.runKernel(\n    Conv2DBackpropFilter, inputs as {} as NamedTensorMap,\n    attrs as {} as NamedAttrMap) as  
Tensor4D;\n}\n\nexport const conv2DBackpropFilter = op({conv2DBackpropFilter_});\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the  
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or  
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *  
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n */\n
```

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=====
\n
*\nimport {Tensor} from './tensor';\nimport * as broadcast_util from './broadcast_util';\nimport {elu} from  
./elu';\nimport {Activation} from './fused_types';\nimport {leakyRelu} from './leaky_relu';\nimport {mul} from
```

```

./mul';\nimport {prelu} from './prelu';\nimport {relu} from './relu';\nimport {relu6} from './relu6';\nimport {reshape}
from './reshape';\nimport {step} from './step';\nimport {sum} from './sum';\n\n// Returns gradient for fused
activation.\nexport function getFusedDyActivation(\n  dy: Tensor, y: Tensor, activation: Activation): Tensor {\n
(activation == null || activation === 'linear') {\n  return dy;\n }\n if (activation === 'relu') {\n  return mul(dy,
step(y));\n }\n throw new Error(\n   `Cannot compute gradient for fused activation ${activation}.`);\n}\n\n//
Returns gradient for fused bias.\nexport function getFusedBiasGradient(\n  bias: Tensor, dyActivation: Tensor):
Tensor {\n  let res = dyActivation;\n  const reduceAxes =\n    broadcast_util.getReductionAxes(bias.shape,
dyActivation.shape);\n  if (reduceAxes.length > 0) {\n    res = sum(res, reduceAxes);\n  }\n  return reshape(res,
bias.shape);\n}\n\nexport function applyActivation(\n  x: Tensor, activation: Activation, preluActivationWeights?:
Tensor,\n  leakyreluAlpha?: number): Tensor {\n  if (activation === 'linear') {\n    return x;\n  } else if (activation
=== 'relu') {\n    return relu(x);\n  } else if (activation === 'elu') {\n    return elu(x);\n  } else if (activation
=== 'relu6') {\n    return relu6(x);\n  } else if (activation === 'prelu') {\n    return prelu(x, preluActivationWeights);\n
} else if (activation === 'leakyrelu') {\n    return leakyRelu(x, leakyreluAlpha);\n  }\n  throw new Error(`Unknown
fused activation ${activation}.`);\n}\n\n// Whether we should call fused ops.\nexport const shouldFuse =
(gradientDepth: number, activation: Activation) => {\n  const gradientMode = gradientDepth > 0;\n  return
!gradientMode || activation === 'linear';\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {ENGINE} from '../engine';\nimport {customGrad} from '../gradients';\nimport {FusedConv2D,
FusedConv2DAttrs, FusedConv2DInputs} from '../kernel_names';\nimport {NamedAttrMap} from
../kernel_registry';\nimport {Tensor, Tensor3D, Tensor4D} from '../tensor';\nimport {GradSaveFunc,
NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport
{convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from
../util';\nimport {add} from './add';\nimport * as broadcast_util from './broadcast_util';\nimport {conv2d as
unfusedConv2d} from './conv2d';\nimport {conv2DBackpropFilter} from './conv2d_backprop_filter';\nimport
{conv2DBackpropInput} from './conv2d_backprop_input';\nimport * as conv_util from './conv_util';\nimport
{Activation} from './fused_types';\nimport {applyActivation, getFusedBiasGradient, getFusedDyActivation,
shouldFuse} from './fused_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n**\n *
Computes a 2D convolution over the input x, optionally fused with adding a\n * bias and applying an activation.\n
*\n * ``js\n * const inputDepth = 2;\n * const inShape = [2, 2, 2, inputDepth];\n * const outputDepth = 2;\n * const
fSize = 1;\n * const pad = 0;\n * const strides = 1;\n * \n * const x = tf.tensor4d([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
13, 14, 15,\n * 16], inShape);\n * const w = tf.tensor4d([-1, 1, -2, 0.5], [fSize, fSize, inputDepth,\n *
outputDepth]);\n * \n * tf.fused.conv2d({ x, filter: w, strides, pad, dataFormat: 'NHWC',\n * dilations: [1, 1], bias:
tf.scalar(5), activation: 'relu' }).print();\n * ``\n * \n * @param obj An object with the following properties:\n *
*\n * @param x The input tensor, of rank 4 or rank 3, of shape\n *   `[batch, height, width, inChannels]`. If rank 3, batch
of 1 is\n * assumed.\n * @param filter The filter, rank 4, of shape\n *   `[filterHeight, filterWidth, inDepth,
outDepth]`. \n * @param strides The strides of the convolution: `[strideHeight,\n * strideWidth]`. \n * @param pad
The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n *   regardless of
filter size.\n * - `valid` output will be smaller than input if filter is larger\n *   than 1x1.\n * - For more info, see
this guide:\n *   [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat An optional string from:
'\n * "NHWC"', '\n * "NCHW"'. Defaults to\n *   "NHWC". Specify the data format of the input and output data. With
the\n * default format "NHWC", the data is stored in the order of: [batch,\n * height, width, channels]. Only

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\`NHWC\` is currently supported.\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]` \n *
in which we sample input values across the height and width dimensions \n * in atrous convolution. Defaults to
`[1, 1]`. If `dilations` is a single \n * number, then `dilationHeight == dilationWidth`. If it is greater than \n * 1,
then all values of `strides` must be 1. \n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none
is \n * provided, it will default to truncate. \n * @param bias Tensor to be added to the result. \n * @param
activation Name of activation kernel (defaults to `linear`) to be \n * applied \n * after biasAdd. \n * @param
preluActivationWeights Tensor of prelu weights to be applied as part \n * of a `prelu` activation, typically the
same shape as `x`. \n * @param leakyreluAlpha Optional. Alpha to be applied as part of a `leakyrelu` \n *
activation. \n */
function fusedConv2d<T extends Tensor3D|Tensor4D>({\n x,\n filter,\n strides,\n pad,\n
dataFormat = 'NHWC',\n dilations = [1, 1],\n dimRoundingMode,\n bias,\n activation = 'linear',\n
preluActivationWeights,\n leakyreluAlpha\n}: {\n x: T|TensorLike,\n filter: Tensor4D|TensorLike,\n strides:
[number, number]|number,\n pad: 'valid'|'same'|number|conv_util.ExplicitPadding,\n dataFormat?:
'NHWC'|'NCHW',\n dilations?: [number, number]|number,\n dimRoundingMode?: 'floor'|'round'|'ceil',\n bias?:
Tensor|TensorLike,\n activation?: Activation,\n preluActivationWeights?: Tensor,\n leakyreluAlpha?: number\n}):
T {\n activation = activation || 'linear';\n\n if (shouldFuse(ENGINE.state.gradientDepth, activation) === false) {\n
let result = unfusedConv2d(\n x, filter, strides, pad, dataFormat, dilations, dimRoundingMode);\n if (bias !=
null) {\n result = add(result, bias);\n }\n\n return applyActivation(\n result, activation,
preluActivationWeights, leakyreluAlpha) as T;\n }\n\n const $x = convertToTensor(x, 'x', 'conv2d');\n const $filter
= convertToTensor(filter, 'filter', 'conv2d');\n\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n\n if
($x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n
}\n\n util.assert(\n x4D.rank === 4,\n () => `Error in fused conv2d: input must be rank 4, but got rank ` +\n
`${x4D.rank}.`);\n util.assert(\n $filter.rank === 4,\n () => `Error in fused conv2d: filter must be rank 4, but
got rank ` +\n `${$filter.rank}.`);\n\n if (dimRoundingMode != null) {\n util.assert(\n util.isInt(pad as
number),\n () => `Error in fused conv2d: pad must be an integer when using, ` +\n `dimRoundingMode
${dimRoundingMode} but got pad ${pad}.`);\n }\n\n util.assert(\n x4D.shape[3] === $filter.shape[2],\n ()
=> `Error in conv2d: depth of input (${x4D.shape[3]}) must match ` +\n `input depth for filter
${$filter.shape[2]}.`);\n\n util.assert(\n conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n () =>
`Error in conv2D: Either strides or dilations must be 1. ` +\n `Got strides ${strides} and dilations
${dilations}`);\n\n util.assert(\n dataFormat === 'NHWC',\n () => `Error in conv2d: got dataFormat of ${\n
dataFormat} but only NHWC is currently supported.`);\n\n const convInfo = conv_util.computeConv2DInfo(\n
x4D.shape, $filter.shape, strides, dilations, pad, dimRoundingMode);\n\n let $bias: Tensor;\n if (bias != null) {\n
$bias = convertToTensor(bias, 'bias', 'fused conv2d');\n [$bias] = makeTypesMatch($bias, $x);\n\n
broadcast_util.assertAndGetBroadcastShape(convInfo.outShape, $bias.shape);\n }\n\n let
$preluActivationWeights: Tensor;\n if (preluActivationWeights != null) {\n $preluActivationWeights =
convertToTensor(\n preluActivationWeights, 'prelu weights', 'fused conv2d');\n }\n\n const grad = (dy:
Tensor4D, saved: Tensor[]) => {\n const [$filter, x4D, y, $bias] =\n saved as [Tensor4D, Tensor4D,
Tensor4D, Tensor];\n\n const dyActivation = getFusedDyActivation(dy, y, activation) as Tensor4D;\n\n
util.assert(\n conv_util.tupleValuesAreOne(dilations),\n () => `Error in gradient of fused conv2D: ` +\n
`dilation rates greater than 1 ` +\n `are not yet supported in gradients. Got dilations '${dilations}'`);\n\n
const xDer =\n conv2DBackpropInput(x4D.shape, dyActivation, $filter, strides, pad);\n const filterDer =\n
conv2DBackpropFilter(x4D, dyActivation, $filter.shape, strides, pad);\n const der: Tensor[] = [xDer,
filterDer];\n\n if ($bias != null) {\n const biasDer = getFusedBiasGradient($bias, dyActivation);\n
der.push(biasDer);\n }\n\n return der;\n };\n\n const inputs: FusedConv2DInputs = {\n x: x4D,\n filter:
$filter,\n bias: $bias,\n preluActivationWeights: $preluActivationWeights\n };\n\n const attrs:
FusedConv2DAttrs = {\n strides,\n pad,\n dataFormat,\n dilations,\n dimRoundingMode,\n activation,\n
leakyreluAlpha\n };\n\n // Depending on the the params passed in we will have different number of\n // inputs and
thus a a different number of elements in the gradient.\n\n if (bias == null) {\n const customOp =\n
customGrad((x4D: Tensor4D, filter: Tensor4D, save: GradSaveFunc) => {\n let res: Tensor4D|Tensor3D =\n

```

```

// tslint:disable-next-line: no-unnecessary-type-assertion\n      ENGINE.runKernel(\n
FusedConv2D, inputs as {} as NamedTensorMap,\n      attrs as {} as NamedAttrMap);\n\n      save([filter,\n
x4D, res]);\n\n      if (reshapedTo4D) {\n      // tslint:disable-next-line: no-unnecessary-type-assertion\n
res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n      Tensor3D;\n      }\n\n      return\n
{value: res, gradFunc: grad};\n      });\n      return customOp(x4D, $filter) as T;\n      } else {\n      const\n
customOpWithBias = customGrad(\n      (x4D: Tensor4D, filter: Tensor4D, bias: Tensor, save: GradSaveFunc) =>\n
{\n      let res: Tensor4D|Tensor3D = ENGINE.runKernel(\n      FusedConv2D, inputs as {} as\n
NamedTensorMap,\n      attrs as {} as NamedAttrMap);\n\n      save([filter, x4D, res, bias]);\n\n      if\n
(reshapedTo4D) {\n      // tslint:disable-next-line: no-unnecessary-type-assertion\n
res = reshape(res,\n
[res.shape[1], res.shape[2], res.shape[3]]) as\n      Tensor3D;\n      }\n\n      return {value: res, gradFunc:\n
grad};\n      });\n\n      return customOpWithBias(x4D, $filter, $bias) as T;\n      } }\n\nexport const conv2d =\n
op({fusedConv2d_});\n","/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n
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License.\n *

```

```

=====\n
*\nimport {ENGINE} from './engine';\nimport {DepthwiseConv2dNativeBackpropFilter,\n
DepthwiseConv2dNativeBackpropFilterAttrs, DepthwiseConv2dNativeBackpropFilterInputs} from\n
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from\n
'./tensor';\nimport {NamedTensorMap} from './tensor_types';\n\nimport {op} from './operation';\nimport {reshape}\n
from './reshape';\n\nfunction depthwiseConv2dNativeBackpropFilter_<T extends Tensor3D|Tensor4D>(\n  x: T,\n
dy: T, filterShape: [number, number, number, number],\n  strides: [number, number]|number, pad:\n
'valid'|'same'|number,\n  dilations: [number, number]|number = [1, 1],\n  dimRoundingMode?: 'floor'|'round'|'ceil':\n
Tensor4D {\n  let x4D = x as Tensor4D;\n  if (x.rank === 3) {\n    x4D = reshape(x, [1, x.shape[0], x.shape[1],\n
x.shape[2]]);\n  }\n  let dy4D = dy as Tensor4D;\n  if (dy4D.rank === 3) {\n    dy4D = reshape(dy, [1, dy.shape[0],\n
dy.shape[1], dy.shape[2]]);\n  }\n\n  const inputs: DepthwiseConv2dNativeBackpropFilterInputs = {x: x4D, dy:\n
dy4D};\n  const attrs: DepthwiseConv2dNativeBackpropFilterAttrs =\n  {\n    strides, pad, dimRoundingMode,\n    dilations, filterShape;\n  }\n\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  return ENGINE.runKernel(\n
    DepthwiseConv2dNativeBackpropFilter,\n    inputs as {} as NamedTensorMap, attrs as {} as\n
NamedAttrMap) as\n    Tensor4D;\n  }\n\nexport const depthwiseConv2dNativeBackpropFilter =\n
op({depthwiseConv2dNativeBackpropFilter_});\n","/*\n * @license\n * Copyright 2020 Google LLC. All Rights\n
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```

```

=====\n
*\nimport {ENGINE} from './engine';\nimport {DepthwiseConv2dNativeBackpropInput,\n
DepthwiseConv2dNativeBackpropInputAttrs, DepthwiseConv2dNativeBackpropInputInputs} from\n
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from\n
'./tensor';\nimport {NamedTensorMap} from './tensor_types';\n\nimport {op} from './operation';\nimport {reshape}\n
from './reshape';\n\nfunction depthwiseConv2dNativeBackpropInput_<T extends Tensor3D|Tensor4D>(\n  xShape:\n
[number, number, number, number], dy: T, filter: Tensor4D,\n  strides: [number, number]|number, pad:\n
'valid'|'same'|number,\n  dilations: [number, number]|number = [1, 1],\n  dimRoundingMode?: 'floor'|'round'|'ceil':\n

```

```

T {
  let dy4D = dy as Tensor4D;
  let reshapedTo4D = false;
  if (dy.rank === 3) {
    reshapedTo4D = true;
    dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);
  }
  const inputs:
  DepthwiseConv2dNativeBackpropInputInputs = {dy: dy4D, filter};
  const attrs:
  DepthwiseConv2dNativeBackpropInputAttrs = {
    strides, pad, dimRoundingMode, dilations, inputShape:
    xShape};
  const res =
    // tslint:disable-next-line: no-unnecessary-type-assertion
    ENGINE.runKernel(
      DepthwiseConv2dNativeBackpropInput, inputs as {} as NamedTensorMap,
      attrs as {} as NamedAttrMap) as T;
  if (reshapedTo4D) {
    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]);
  }
  return res;
}
export const depthwiseConv2dNativeBackpropInput =
op({depthwiseConv2dNativeBackpropInput_});

```

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 software distributed under the License is distributed on an "AS IS" BASIS,
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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 limitations under the License.

```

import {ENGINE} from '../engine';
import {customGrad} from '../gradients';
import {FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs} from
../kernel_names';
import {NamedAttrMap} from '../kernel_registry';
import {Tensor, Tensor3D, Tensor4D} from
../tensor';
import {GradSaveFunc, NamedTensorMap} from
../tensor_types';
import {makeTypesMatch} from
../tensor_util';
import {convertToTensor} from
../tensor_util_env';
import {TensorLike} from
../types';
import * as util from
../util';
import {add} from
../add';
import * as broadcast_util from
../broadcast_util';
import * as conv_util from
../conv_util';
import {depthwiseConv2d as unfusedDepthwiseConv2d} from
../depthwise_conv2d';
import {depthwiseConv2dNativeBackpropFilter} from
../depthwise_conv2d_native_backprop_filter';
import {depthwiseConv2dNativeBackpropInput} from
../depthwise_conv2d_native_backprop_input';
import {Activation} from
../fused_types';
import {applyActivation, getFusedBiasGradient, getFusedDyActivation, shouldFuse} from
../fused_util';
import {op} from
../operation';
import {reshape} from
../reshape';

```

Computes depthwise 2D convolution, optionally fused with adding a bias and applying an activation.
 Given a 4D `input` array and a `filter` array of shape
 `[filterHeight, filterWidth, inChannels, channelMultiplier]` containing
 `inChannels` convolutional filters of depth 1, this op applies a
 different filter to each input channel (expanding from 1 channel to
 `channelMultiplier` channels for each), then concatenates the results
 together. The output has `inChannels * channelMultiplier` channels.
 See
 https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d
 for more details.

@param obj An object with the following properties:

- @param x The input tensor, of rank 4 or rank 3, of shape
 `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.
- @param filter The filter tensor, rank 4, of shape
 `[filterHeight, filterWidth, inChannels, channelMultiplier]`.
- @param strides The strides of the convolution:
 `[strideHeight, strideWidth]`. If strides is a single number, then
 `strideHeight == strideWidth`.
- @param pad The type of padding algorithm.
 - `same` and stride 1: output will be of same size as input,
 regardless of filter size.
 - `valid`: output will be smaller than input if filter is larger
 than 1x1.

For more info, see this guide:
 https://www.tensorflow.org/api_guides/python/nn#Convolution

@param dilations The dilation rates:
 `[dilationHeight, dilationWidth]` in which we sample input values
 across the height and width dimensions in atrous convolution.
 Defaults to `[1, 1]`. If `rate` is a single number, then
 `dilationHeight == dilationWidth`. If it is greater than 1, then
 all values of `strides` must be 1.

@param dataType An optional string from:
 `"NHWC"`, `"NCHW"`. Defaults to `"NHWC"`. Specify the data format
 of the input and output data. With the default format
 `"NHWC"`, the data is stored in the order of:
 [batch, height, width,

```

channels]. Only \"NHWC\" is currently supported.\n * @param dimRoundingMode A string from: 'ceil', 'round',
'floor'. If none is\n * provided, it will default to truncate.\n * @param bias Tensor to be added to the result.\n *
@param activation Name of activation kernel (defaults to `linear`).\n * @param preluActivationWeights Tensor of
prelu weights to be applied as part\n * of a `prelu` activation, typically the same shape as `x`.\n * @param
leakyreluAlpha Optional. Alpha to be applied as part of a `leakyrelu`\n * activation.\n */\nfunction
fusedDepthwiseConv2d<T extends Tensor3D|Tensor4D>({\n  x,\n  filter,\n  strides,\n  pad,\n  dataFormat =
'NHWC',\n  dilations = [1, 1],\n  dimRoundingMode,\n  bias,\n  activation = 'linear',\n  preluActivationWeights,\n
leakyreluAlpha\n}: {\n  x: T|TensorLike,\n  filter: Tensor4D|TensorLike,\n  strides: [number, number]|number,\n
pad: 'valid'|'same'|number,\n  dataFormat?: 'NHWC'|'NCHW',\n  dilations?: [number, number]|number,\n
dimRoundingMode?: 'floor'|'round'|'ceil',\n  bias?: Tensor|TensorLike,\n  activation?: Activation,\n
preluActivationWeights?: Tensor,\n  leakyreluAlpha?: number\n}): T {\n  if
(shouldFuse(ENGINE.state.gradientDepth, activation) === false) {\n    let result = unfusedDepthwiseConv2d(\n
x, filter, strides, pad, dataFormat, dilations, dimRoundingMode);\n    if (bias != null) {\n      result = add(result,
bias);\n    }\n    return applyActivation(\n      result, activation, preluActivationWeights, leakyreluAlpha) as
T;\n  }\n\n  const $x = convertToTensor(x, 'x', 'depthwiseConv2d');\n  const $filter = convertToTensor(filter, 'filter',
'depthwiseConv2d');\n\n  let x4D = $x as Tensor4D;\n  let reshapedTo4D = false;\n  if ($x.rank === 3) {\n
  reshapedTo4D = true;\n  x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n  }\n  util.assert(\n
x4D.rank === 4,\n    () => `Error in fused depthwiseConv2d: input must be rank 4, but got `+\n    `rank
${x4D.rank}.`);\n  util.assert(\n    $filter.rank === 4,\n    () => `Error in fused depthwiseConv2d: filter must be
rank 4, `+\n    `but got rank ${$filter.rank}.`);\n  util.assert(\n    x4D.shape[3] === $filter.shape[2],\n    () =>
`Error in fused depthwiseConv2d: number of input channels `+\n    `(${x4D.shape[3]}) must match the
inChannels dimension in `+\n    `filter ${$filter.shape[2]}.`);\n  if (dilations == null) {\n    dilations = [1, 1];\n
  }\n  util.assert(\n    conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n    () =>\n    `Error in fused
depthwiseConv2d: Either strides or dilations must `+\n    `be 1. Got strides ${strides} and dilations
`${dilations}``);\n  if (dimRoundingMode != null) {\n    util.assert(\n      util.isInt(pad as number),\n      () =>
`Error in fused depthwiseConv2d: pad must be an integer when `+\n      `using dimRoundingMode
${dimRoundingMode} but got pad ${pad}.`);\n  }\n\n  const convInfo = conv_util.computeConv2DInfo(\n
x4D.shape, $filter.shape, strides, dilations, pad, dimRoundingMode,\n    true /* depthwise */);\n\n  let $bias:
Tensor;\n  if (bias != null) {\n    $bias = convertToTensor(bias, 'bias', 'fused conv2d');\n    [$bias] =
makeTypesMatch($bias, $x);\n    broadcast_util.assertAndGetBroadcastShape(convInfo.outShape, $bias.shape);\n  }\n\n
let $preluActivationWeights: Tensor;\n  if (preluActivationWeights != null) {\n    $preluActivationWeights =
convertToTensor(\n      preluActivationWeights, 'prelu weights', 'fused depthwiseConv2d');\n  }\n\n  const grad =
(dy: Tensor4D, saved: Tensor[]) => {\n    util.assert(\n      conv_util.tupleValuesAreOne(dilations),\n      () =>
`Error in gradient of fused depthwiseConv2d: dilation rates `+\n      `greater than 1 are not yet supported. Got
dilations `+\n      ``${dilations}``);\n    const [$filter, x4D, y, bias] = saved;\n\n    const dyActivation =
getFusedDyActivation(dy, y, activation) as Tensor4D;\n\n    const xDer = depthwiseConv2dNativeBackpropInput(\n
(x4D as Tensor4D).shape, dyActivation, $filter as Tensor4D, strides,\n      pad, dilations,
dimRoundingMode);\n    const filterDer = depthwiseConv2dNativeBackpropFilter(\n      x4D as Tensor4D,
dyActivation, ($filter as Tensor4D).shape, strides,\n      pad, dilations, dimRoundingMode);\n\n    if (bias != null)
{\n      const biasDer = getFusedBiasGradient($bias, dyActivation);\n      return [xDer, filterDer, biasDer];\n    }\n
return [xDer, filterDer];\n  };\n\n  const inputs: FusedDepthwiseConv2DInputs = {\n    x: x4D,\n    filter: $filter,\n
bias: $bias,\n    preluActivationWeights: $preluActivationWeights\n  };\n  const attrs: FusedDepthwiseConv2DAttrs
= {\n    strides,\n    pad,\n    dataFormat,\n    dilations,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n
  };\n\n  // Depending on the the params passed in we will have different number of\n  // inputs and thus a a different
number of elements in the gradient.\n  if (bias == null) {\n    const customOp =\n      customGrad((x4D: Tensor4D,
filter: Tensor4D, save: GradSaveFunc) => {\n      // tslint:disable-next-line: no-unnecessary-type-assertion\n
let res: Tensor4D|Tensor3D = ENGINE.runKernel(\n        FusedDepthwiseConv2D, inputs as { } as
NamedTensorMap,\n        attrs as { } as NamedAttrMap);\n      save([filter, x4D, res]);\n      if

```

```
(reshapedTo4D) {\n      // tslint:disable-next-line: no-unnecessary-type-assertion\n      res = reshape(res,\n [res.shape[1], res.shape[2], res.shape[3]]) as\n      Tensor3D;\n    }\n    return {value: res, gradFunc:\n grad};\n  });\n  return customOp(x4D, $filter) as T;\n } else {\n  const customOpWithBias = customGrad(\n (x4D: Tensor4D, filter: Tensor4D, bias: Tensor, save: GradSaveFunc) => {\n      // tslint:disable-next-line: no-\n unnecessary-type-assertion\n      let res: Tensor4D|Tensor3D = ENGINE.runKernel(\n FusedDepthwiseConv2D, inputs as {} as NamedTensorMap,\n      attrs as {} as NamedAttrMap);\n    save([filter, x4D, res, bias]);\n    if (reshapedTo4D) {\n      // tslint:disable-next-line: no-unnecessary-type-\n assertion\n      res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n      Tensor3D;\n    }\n    return {value: res, gradFunc: grad};\n  });\n  return customOpWithBias(x4D, $filter, $bias) as T;\n }\n}\n\nexport const depthwiseConv2d = op({fusedDepthwiseConv2d_});\n\n"/**\n * @license\n * Copyright 2019\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\nimport {ENGINE} from '../engine';\nimport {customGrad} from '../gradients';\nimport {_FusedMatMul,\n _FusedMatMulAttrs, _FusedMatMulInputs} from '../kernel_names';\nimport {NamedAttrMap} from\n '../kernel_registry';\nimport {Tensor, Tensor3D} from '../tensor';\nimport {GradSaveFunc, NamedTensorMap}\n from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from\n '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {add} from\n './add';\nimport * as broadcast_util from './broadcast_util';\nimport {Activation} from './fused_types';\nimport\n {applyActivation, getFusedBiasGradient, getFusedDyActivation, shouldFuse} from './fused_util';\nimport {matMul\n as unfusedMatMul} from './mat_mul';\nimport {op} from './operation';\nimport {reshape} from\n './reshape';\n\n/**\n * Computes the dot product of two matrices with optional activation and bias.\n *\n *`a`\n *`b`\n *`transposeA`\n *`transposeB`\n *`bias`\n *`activation`\n *`preluActivationWeights`\n *`leakyreluAlpha`\n *\n *`a` First matrix in dot product operation.\n *`b` Second matrix in dot product\n operation.\n *`transposeA` If true, `a` is transposed before multiplication.\n *`transposeB` If true, `b` is\n transposed before multiplication.\n *`bias` Matrix to be added to the result.\n *`activation` Name of activation\n kernel (defaults to `linear`).\n *`preluActivationWeights` Tensor of prelu weights.\n *`leakyreluAlpha` Alpha of\n leakyrelu.\n */\n\nfunction fusedMatMul<T extends Tensor>({\n  a,\n  b,\n  transposeA = false,\n  transposeB =\n false,\n  bias,\n  activation = 'linear',\n  preluActivationWeights,\n  leakyreluAlpha,\n}: {\n  a: T|TensorLike,\n  b:\n T|TensorLike,\n  transposeA?: boolean,\n  transposeB?: boolean,\n  bias?: Tensor|TensorLike,\n  activation?:\n Activation,\n  preluActivationWeights?: Tensor,\n  leakyreluAlpha?: number\n}): T {\n  if\n (shouldFuse(ENGINE.state.gradientDepth, activation) === false) {\n    let result = unfusedMatMul(a, b,\n transposeA, transposeB);\n    if (bias != null) {\n      result = add(result, bias);\n    }\n    return\n applyActivation(\n      result, activation, preluActivationWeights, leakyreluAlpha) as\n      T;\n  }\n\n  $a = convertToTensor(a, 'a', 'fused matMul');\n  let $b = convertToTensor(b, 'b', 'fused matMul');\n  [$a, $b] =\n makeTypesMatch($a, $b);\n  const innerShapeA =\n transposeA ? $a.shape[$a.rank - 2] : $a.shape[$a.rank -\n 1];\n  const innerShapeB =\n transposeB ? $b.shape[$b.rank - 1] : $b.shape[$b.rank - 2];\n  const\n outerShapeA =\n transposeA ? $a.shape[$a.rank - 1] : $a.shape[$a.rank - 2];\n  const outerShapeB =\n transposeB ? $b.shape[$b.rank - 2] : $b.shape[$b.rank - 1];\n  const\n outerDimsA = $a.shape.slice(0, -2);\n  const\n outerDimsB = $b.shape.slice(0, -2);\n  const batchDimA = util.sizeFromShape(outerDimsA);\n  const\n batchDimB = util.sizeFromShape(outerDimsB);\n  util.assert(\n    $a.rank >= 2 && $b.rank >= 2 && $a.rank ===\n $b.rank,\n    () => `Error in fused matMul: inputs must have the same rank of at\n    ` +\n    `least 2, got ranks\n    ${$a.rank} and ${$b.rank}.`);\n  util.assert(\n    util.arraysEqual(outerDimsA, outerDimsB),\n    () => `Error
```



```

in fused matMul: outer dimensions (${outerDimsA}) and (^ +\n      `${outerDimsB}) of Tensors with shapes
`${a.shape} and ` +\n      `${b.shape} must match.`);\n\n util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in fused matMul: inner shapes (${innerShapeA}) and (^ +\n      `${innerShapeB}) of Tensors
with shapes `${a.shape} and ` +\n      `${b.shape} and transposeA=${transposeA}` +\n      ` and
transposeB=${transposeB} must match.`);\n\n      const outShape = $a.shape.slice(0, -2).concat([outerShapeA,
outerShapeB]);\n\n      const a3D: Tensor3D = transposeA ?\n      reshape($a, [batchDimA, innerShapeA,
outerShapeA]) :\n      reshape($a, [batchDimA, outerShapeA, innerShapeA]);\n      const b3D: Tensor3D =
transposeB ?\n      reshape($b, [batchDimB, outerShapeB, innerShapeB]) :\n      reshape($b, [batchDimB,
innerShapeB, outerShapeB]);\n\n      let $bias: Tensor;\n      if (bias !== null) {\n      $bias = convertToTensor(bias,
'bias', 'fused matMul');\n      [$bias] = makeTypesMatch($bias, $a);\n\n      broadcast_util.assertAndGetBroadcastShape(outShape, $bias.shape);\n      }\n\n      let $preluActivationWeights:
Tensor;\n      if (preluActivationWeights !== null) {\n      $preluActivationWeights = convertToTensor(\n
preluActivationWeights, 'prelu weights', 'fused matMul');\n      }\n\n      const grad = (dy: Tensor3D, saved: Tensor[])
=> {\n      const [a3D, b3D, y, $bias] = saved;\n      // we reshape dy because the result of the forward is not\n      //
necessarily going to be a 3d tensor due to a reshape done at the end of\n      // the customOp.\n      const dyActivation
=\n      getFusedDyActivation(reshape(dy, y.shape), y, activation);\n      let aDer: Tensor;\n      let bDer:
Tensor;\n\n      if (!transposeA && !transposeB) {\n      aDer = unfusedMatMul(dyActivation, b3D, false, true);\n
      bDer = unfusedMatMul(a3D, dyActivation, true, false);\n      } else if (!transposeA && transposeB) {\n      aDer
= unfusedMatMul(dyActivation, b3D, false, false);\n      bDer = unfusedMatMul(dyActivation, a3D, true, false);\n
      } else if (transposeA && !transposeB) {\n      aDer = unfusedMatMul(b3D, dyActivation, false, true);\n      bDer
= unfusedMatMul(a3D, dyActivation, false, false);\n      } else {\n      aDer = unfusedMatMul(b3D, dyActivation,
true, true);\n      bDer = unfusedMatMul(dyActivation, a3D, true, true);\n      }\n\n      if (bias !== null) {\n      const
biasDer = getFusedBiasGradient($bias, dyActivation);\n      return [aDer, bDer, biasDer];\n      } else {\n      return
[aDer, bDer];\n      }\n      };\n\n      const inputs: _FusedMatMulInputs = {\n      a: a3D,\n      b: b3D,\n      bias: $bias,\n
      preluActivationWeights: $preluActivationWeights\n      };\n      const attrs: _FusedMatMulAttrs =\n
      {transposeA, transposeB, activation, leakyreluAlpha};\n\n      // Depending on the the params passed in we will have
different number of\n      // inputs and thus a a different number of elements in the gradient.\n      if (bias === null) {\n
      const customOp =\n      customGrad((a3D: Tensor3D, b3D: Tensor3D, save: GradSaveFunc) => {\n      const
res =\n      // tslint:disable-next-line: no-unnecessary-type-assertion\n      ENGINE.runKernel(\n
      _FusedMatMul, inputs as {} as NamedTensorMap,\n      attrs as {} as NamedAttrMap) as T;\n\n      save([a3D, b3D, res]);\n\n      return {value: reshape(res, outShape), gradFunc: grad};\n      });\n      return
customOp(a3D, b3D) as T;\n      } else {\n      const customOpWithBias = customGrad(\n      (a3D: Tensor3D, b3D:
Tensor3D, $bias: Tensor, save: GradSaveFunc) => {\n      const res =\n      // tslint:disable-next-line: no-
unnecessary-type-assertion\n      ENGINE.runKernel(\n
      _FusedMatMul, inputs as {} as
NamedTensorMap,\n      attrs as {} as NamedAttrMap) as T;\n\n      save([a3D, b3D, res, $bias]);\n\n      return {value: reshape(res, outShape), gradFunc: grad};\n      });\n\n      return customOpWithBias(a3D, b3D,
$bias) as T;\n      }\n      }\n\n      export const matMul = op({fusedMatMul_});\n\n      /*\n      * @license\n      * Copyright 2019
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OR CONDITIONS OF ANY KIND, either express or implied.\n      * See the License for the specific language
governing permissions and\n      * limitations under the License.\n      */
\n      =====\n\n      *\n\n      import {conv2d} from './fused/conv2d';\n      import {depthwiseConv2d} from
 './fused/depthwise_conv2d';\n      import {matMul} from './fused/mat_mul';\n      import {Activation} from
 './fused_types';\n\n      export {Activation, conv2d, depthwiseConv2d, matMul};\n\n      /*\n      * @license\n      * Copyright
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```
=====\n*\n\nimport {Tensor1D} from '../tensor';\nimport {op} from '../operation';\nimport {cosineWindow} from\n '../signal_ops_util';\n\n/**\n * Generate a hamming window.\n *\n * See:  
https://en.wikipedia.org/wiki/Window_function#Hann_and_Hamming_windows\n *\n * ```js\n * tf.signal.hammingWindow(10).print();\n * ```\n * @param The length of window\n *\n * @doc {heading:\n 'Operations', subheading: 'Signal', namespace: 'signal'}\n *\n * \nfunction hammingWindow_(windowLength: number):\n Tensor1D {\n return cosineWindow(windowLength, 0.54, 0.46);\n }\n\nexport const hammingWindow =\n op({hammingWindow_});\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in  
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```

```
=====\n*\n\nimport {Tensor1D} from '../tensor';\nimport {op} from '../operation';\nimport {cosineWindow} from\n '../signal_ops_util';\n\n/**\n * Generate a Hann window.\n *\n * See:  
https://en.wikipedia.org/wiki/Window_function#Hann_and_Hamming_windows\n *\n * ```js\n * tf.signal.hannWindow(10).print();\n * ```\n * @param The length of window\n *\n * @doc {heading: 'Operations',\n subheading: 'Signal', namespace: 'signal'}\n *\n * \nfunction hannWindow_(windowLength: number): Tensor1D {\n return cosineWindow(windowLength, 0.5, 0.5);\n }\n\nexport const hannWindow = op({hannWindow_});\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
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```
=====\n*\n\nimport {Tensor, Tensor1D} from '../tensor';\nimport {concat} from '../concat';\nimport {fill} from\n '../fill';\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\nimport {slice} from '../slice';\nimport\n {tensor2d} from '../tensor2d';\n\n/**\n * Expands input into frames of frameLength.\n * Slides a window size with  
frameStep.\n *\n * ```js\n * tf.signal.frame([1, 2, 3], 2, 1).print();\n * ```\n * @param signal The input tensor to be  
expanded\n * @param frameLength Length of each frame\n * @param frameStep The frame hop size in samples.\n *\n * @param padEnd Whether to pad the end of signal with padValue.\n * @param padValue An number to use where  
the input signal does\n * not exist when padEnd is True.\n *\n * @doc {heading: 'Operations', subheading:\n 'Signal', namespace: 'signal'}\n *\n * \nfunction frame_(\n signal: Tensor1D, frameLength: number, frameStep:\n number, padEnd = false,\n padValue = 0): Tensor {\n let start = 0;\n const output: Tensor[] = [];\n while (start +\n frameLength <= signal.size) {\n output.push(slice(signal, start, frameLength));\n start += frameStep;\n }\n\n if\n (padEnd) {\n while (start < signal.size) {\n const padLen = (start + frameLength) - signal.size;\n const pad =\n concat([\n slice(signal, start, frameLength - padLen), fill([padLen], padValue)\n ]);\n output.push(pad);\n start += frameStep;\n }\n }\n\n if (output.length === 0) {\n return tensor2d([], [0, frameLength]);\n }\n\n return reshape(concat(output), [output.length, frameLength]);\n }\n\nexport const frame = op({frame_});\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version
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*\n\nimport {Tensor, Tensor1D} from '../tensor';\nimport {concat} from '../concat';\nimport {mul} from\n../mul';\nimport {op} from '../operation';\nimport {enclosingPowerOfTwo} from '../signal_ops_util';\nimport {slice}\nfrom '../slice';\nimport {rfft} from '../spectral/rfft';\nimport {frame} from './frame';\nimport {hannWindow} from\n./hann_window';\n\n/**\n * Computes the Short-time Fourier Transform of signals\n * See:\n * https://en.wikipedia.org/wiki/Short-time_Fourier_transform\n * \n * const input = tf.tensor1d([1, 1, 1, 1, 1])\n * tf.signal.stft(input, 3, 1).print();\n * \n * @param signal 1-dimensional real value tensor.\n * @param\n * frameLength The window length of samples.\n * @param frameStep The number of samples to step.\n * @param\n * fftLength The size of the FFT to apply.\n * @param windowFn A callable that takes a window length and returns 1-\n * d tensor.\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n */\nfunction stft_(\n  signal: Tensor1D, frameLength: number, frameStep: number,\n  fftLength?: number, windowFn: (length:\n  number) => Tensor1D = hannWindow): Tensor {\n  if (fftLength ==\n  null) {\n    fftLength =\n    enclosingPowerOfTwo(frameLength);\n  }\n  const framedSignal = frame(signal, frameLength, frameStep);\n  const\n  windowedSignal = mul(framedSignal, windowFn(frameLength));\n  const output: Tensor[] = [];\n  for (let i = 0; i <\n  framedSignal.shape[0]; i++) {\n    output.push(\n      rfft(slice(windowedSignal, [i, 0], [1, frameLength]),\n      fftLength);\n    }\n  }\n  return concat(output);\n}\n\nexport const stft = op({stft_});\n\n/*\n * @license\n * Copyright\n * 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n
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*\n\nimport {ENGINE} from '../engine';\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs}\nfrom '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor1D, Tensor2D,\nTensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor}\nfrom '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {op}\nfrom '../operation';\n\n/**\n * Extracts crops from the input image tensor and resizes them using bilinear\n * sampling or nearest neighbor sampling (possibly with aspect ratio change)\n * to a common output size specified by\n * cropSize.\n * \n * @param image 4d tensor of shape `[batch,imageHeight,imageWidth, depth]`,\n * where\n * imageHeight and imageWidth must be positive, specifying the\n * batch of images from which to take crops\n * \n * @param boxes 2d float32 tensor of shape `[numBoxes, 4]`. Each entry is\n * `[y1, x1, y2, x2]`, where `(y1, x1)`\n * and `(y2, x2)` are the normalized\n * coordinates of the box in the boxInd[i]th image in the batch\n * \n * @param\n * boxInd 1d int32 tensor of shape `[numBoxes]` with values in range\n * `[0, batch)` that specifies the image that\n * the `i`-th box refers to.\n * \n * @param cropSize 1d int32 tensor of 2 elements `[cropHeigh, cropWidth]`\n * specifying the size to which all crops are resized to.\n * \n * @param method Optional string from `bilinear` |`nearest`,\n * defaults to bilinear, which specifies the sampling method for resizing\n * \n * @param\n * extrapolationValue A threshold for deciding when to remove boxes based\n * on score. Defaults to 0.\n * \n * @return\n * A 4D tensor of the shape `[numBoxes,cropHeight,cropWidth,depth]`\n * \n * @doc {heading: 'Operations',\n * subheading: 'Images', namespace: 'image'}\n */\nfunction cropAndResize_(\n  image: Tensor4D|TensorLike,\n  boxes: Tensor2D|TensorLike,\n  boxInd: Tensor1D|TensorLike,\n  cropSize: [number, number],\n  method:\n  'bilinear'|'nearest' = 'bilinear',\n  extrapolationValue = 0,)\n  : Tensor4D {\n  const $image =\n  convertToTensor(image, 'image', 'cropAndResize');\n  const $boxes = convertToTensor(boxes, 'boxes',\n
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'cropAndResize', 'float32');\n const $boxInd = convertToTensor(boxInd, 'boxInd', 'cropAndResize', 'int32');\n\n const numBoxes = $boxes.shape[0];\n\n util.assert(\n  $image.rank === 4,\n  () => `Error in cropAndResize: image must be rank 4,` +\n  `but got rank ${$image.rank}.`);\n util.assert(\n  $boxes.rank === 2 &&\n  $boxes.shape[1] === 4,\n  () => `Error in cropAndResize: boxes must be have size [${numBoxes},4]` +\n  `but had shape ${$boxes.shape}.`);\n util.assert(\n  $boxInd.rank === 1 && $boxInd.shape[0] === numBoxes,\n  () => `Error in cropAndResize: boxInd must be have size [${numBoxes}]` +\n  `but had shape ${$boxes.shape}.`);\n util.assert(\n  cropSize.length === 2,\n  () => `Error in cropAndResize: cropSize must be of length 2, but got` +\n  `length ${cropSize.length}.`);\n util.assert(\n  cropSize[0] >= 1 && cropSize[1] >= 1,\n  () => `cropSize must be atleast [1,1], but was ${cropSize}`);\n util.assert(\n  method === 'bilinear' ||\n  method === 'nearest',\n  () => `method must be bilinear or nearest, but was ${method}`);\n\n const inputs:\n CropAndResizeInputs = {image: $image, boxes: $boxes, boxInd: $boxInd};\n const attrs: CropAndResizeAttrs = {method, extrapolationValue, cropSize};\n const res = ENGINE.runKernel(\n  CropAndResize, inputs as {} as NamedTensorMap,\n  attrs as {} as NamedAttrMap);\n return res as Tensor4D;\n}\n\nexport const\n cropAndResize = op({cropAndResize_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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=====\n*\n\nimport {ENGINE} from '../engine';\nimport {FlipLeftRight, FlipLeftRightInputs} from\n '../kernel_names';\nimport {Tensor4D} from '../tensor';\nimport {NamedTensorMap} from\n '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from\n '../types';\nimport * as util from '../util';\nimport {op} from '../operation';\n\n/**\n * Flips the image left to right. Currently available in the CPU, WebGL, and\n * WASM backends.\n * \n * @param image 4d tensor of shape [batch, imageHeight, imageWidth, depth]\n * \n * @doc {heading: 'Operations', subheading: 'Images',\n namespace: 'image'}\n */\nfunction flipLeftRight_(image: Tensor4D|TensorLike): Tensor4D {\n  const $image =\n  convertToTensor(image, 'image', 'flipLeftRight', 'float32');\n\n  util.assert(\n    $image.rank === 4,\n    () => `Error in flipLeftRight: image must be rank 4,` +\n    `but got rank ${$image.rank}.`);\n\n  const inputs:\n  FlipLeftRightInputs = {image: $image};\n\n  const res =\n  ENGINE.runKernel(FlipLeftRight, inputs as {} as\n  NamedTensorMap, {});\n\n  return res as Tensor4D;\n}\n\nexport const flipLeftRight =\n  op({flipLeftRight_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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=====\n*\n\nimport {ENGINE} from '../engine';\nimport {RotateWithOffset, RotateWithOffsetAttrs,\n RotateWithOffsetInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from\n '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from\n '../operation';\n\n/**\n * Rotates the input image tensor counter-clockwise with an optional offset\n * center of rotation. Currently available in the CPU, WebGL, and WASM backends.\n * \n * @param image 4d tensor of shape [batch, imageHeight, imageWidth, depth]\n * \n * @param radians The amount of rotation.\n * \n * @param fillValue The value to fill in the empty space leftover\n * after rotation. Can be either a single grayscale value (0-255), or an
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    array of three numbers `[red, green, blue]` specifying the red, green,
    and blue channels. Defaults to `[0, 0, 0]` (black).
    @param center The center of rotation. Can be either a single value (0-1), or
    an array of two numbers `[centerX, centerY]`. Defaults to `[0.5, 0.5]` (rotates
    the image around its center).
    @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}
  \nfunction rotateWithOffset_(\n  image:
  Tensor4D|TensorLike, radians: number,\n  fillValue: number|[number, number, number] = 0,\n  center:
  number|[number, number] = 0.5): Tensor4D {\n  const $image = convertToTensor(image, 'image',
  'rotateWithOffset', 'float32');\n  util.assert(\n    $image.rank === 4,\n    () => 'Error in rotateWithOffset: image
  must be rank 4,' +\n    `but got rank ${$image.rank}.`);\n  const inputs: RotateWithOffsetInputs = {image:
  $image};\n  const attrs: RotateWithOffsetAttrs = {radians, fillValue, center};\n  const res = ENGINE.runKernel(\n
  RotateWithOffset, inputs as {} as NamedTensorMap,\n  attrs as {} as NamedAttrMap);\n  return res as
  Tensor4D;\n}\n\nexport const rotateWithOffset = op({rotateWithOffset_});\n"/**\n * @license\n * Copyright
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*\n\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport * as util from '../util';\n\nfunction
nonMaxSupSanityCheck(\n  boxes: Tensor2D, scores: Tensor1D, maxOutputSize: number,\n  iouThreshold:
  number, scoreThreshold: number, softNmsSigma?: number): {\n  maxOutputSize: number,\n  iouThreshold:
  number,\n  scoreThreshold: number,\n  softNmsSigma: number\n} {\n  if (iouThreshold == null) {\n    iouThreshold
  = 0.5;\n  }\n  if (scoreThreshold == null) {\n    scoreThreshold = Number.NEGATIVE_INFINITY;\n  }\n  if
  (softNmsSigma == null) {\n    softNmsSigma = 0.0;\n  }\n  const numBoxes = boxes.shape[0];\n  maxOutputSize
  = Math.min(maxOutputSize, numBoxes);\n  util.assert(\n    0 <= iouThreshold && iouThreshold <= 1,\n    () =>
  `iouThreshold must be in [0, 1], but was '${iouThreshold}`);\n  util.assert(\n    boxes.rank === 2,\n    () =>
  `boxes must be a 2D tensor, but was of rank '${boxes.rank}`);\n  util.assert(\n    boxes.shape[1] === 4,\n    () =>
  `boxes must have 4 columns, but 2nd dimension was ${boxes.shape[1]}`);\n  util.assert(scores.rank === 1, () =>
  `scores must be a 1D tensor`);\n  util.assert(\n    scores.shape[0] === numBoxes,\n    () => `scores has
  incompatible shape with boxes. Expected ${numBoxes}, ` +\n    `but was ${scores.shape[0]}`);\n  util.assert(\n
  0 <= softNmsSigma && softNmsSigma <= 1,\n    () => `softNmsSigma must be in [0, 1], but was
  '${softNmsSigma}`);\n  return {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma};\n}\n\nexport
  {nonMaxSupSanityCheck};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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*\n\nimport {ENGINE} from '../engine';\nimport {NonMaxSuppressionV3} from '../kernel_names';\nimport
  {Tensor1D, Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
  {TensorLike} from '../types';\n\nimport {nonMaxSupSanityCheck} from '../nonmax_util';\nimport {op} from
  '../operation';\n\n/**\n * Performs non maximum suppression of bounding boxes based on\n * iou (intersection over
  union).\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n *   `[y1, x1, y2, x2]`, where
  `(y1, x1)` and `(y2, x2)` are the corners of\n *   the bounding box.\n * @param scores a 1d tensor providing the
  box scores of shape `[numBoxes]`.\n * @param maxOutputSize The maximum number of boxes to be selected.\n *
  @param iouThreshold A float representing the threshold for deciding whether\n *   boxes overlap too much with

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respect to IOU. Must be between [0, 1].\n * Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n * on score. Defaults to -inf, which means any score is accepted.\n * @return A 1D tensor with the selected box indices.\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction nonMaxSuppression_(\n boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n maxSize: number, iouThreshold = 0.5,\n scoreThreshold = Number.NEGATIVE_INFINITY): Tensor1D {\n const \$boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppression');\n const \$scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');\n\n const inputs = nonMaxSupSanityCheck(\n \$boxes, \$scores, maxSize, iouThreshold, scoreThreshold);\n\n maxSize = inputs.maxOutputSize;\n iouThreshold = inputs.iouThreshold;\n scoreThreshold = inputs.scoreThreshold;\n\n const attrs = {maxOutputSize, iouThreshold, scoreThreshold};\n\n return ENGINE.runKernel(\n NonMaxSuppressionV3, {boxes: \$boxes, scores: \$scores}, attrs);\n}\n\nexport const nonMaxSuppression = op({nonMaxSuppression_});\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n */\n\n * Inserts a value into a sorted array. This method allows duplicate, meaning it\n * allows inserting duplicate value, in which case, the element will be inserted\n * at the lowest index of the value.\n * @param arr The array to modify.\n * @param element The element to insert.\n * @param comparator Optional. If no comparator is specified, elements are\n * compared using array_util.defaultComparator, which is suitable for Strings\n * and Numbers in ascending arrays. If the array contains multiple instances of\n * the target value, the left-most instance will be returned. To provide a\n * comparator, it should take 2 arguments to compare and return a negative,\n * zero, or a positive number.\n */\nexport function binaryInsert<T>(\n arr: T[], element: T, comparator?: (a: T, b: T) => number) {\n const index = binarySearch(arr, element, comparator);\n const insertionPoint = index < 0 ? -(index + 1) : index;\n arr.splice(insertionPoint, 0, element);\n}\n\n * Searches the array for the target using binary search, returns the index\n * of the found element, or position to insert if element not found. If no\n * comparator is specified, elements are compared using array_\n * util.defaultComparator, which is suitable for Strings and Numbers in\n * ascending arrays. If the array contains multiple instances of the target\n * value, the left-most instance will be returned.\n * @param arr The array to be searched in.\n * @param target The target to be searched for.\n * @param comparator Should take 2 arguments to compare and return a negative,\n * zero, or a positive number.\n * @return Lowest index of the target value if found, otherwise the insertion\n * point where the target should be inserted, in the form of\n * (-insertionPoint - 1).\n */\nexport function binarySearch<T>(\n arr: T[], target: T, comparator?: (a: T, b: T) => number) {\n return binarySearch_(arr, target, comparator || defaultComparator);\n}\n\n * Compares its two arguments for order.\n * @param a The first element to be compared.\n * @param b The second element to be compared.\n * @return A negative number, zero, or a positive number as the first\n * argument is less than, equal to, or greater than the second.\n */\nfunction defaultComparator<T>(a: T, b: T): number {\n return a > b ? 1 : a < b ? -1 : 0;\n}\n\nfunction binarySearch_<T>(\n arr: T[], target: T, comparator: (a: T, b: T) => number) {\n let left = 0;\n let right = arr.length;\n let middle = 0;\n let found = false;\n while (left < right) {\n middle = left + ((right - left) >>> 1);\n const compareResult = comparator(target, arr[middle]);\n if (compareResult > 0) {\n left = middle + 1;\n } else {\n right = middle;\n // If compareResult is 0, the value is found. We record it is found,\n // and then keep looking because there may be duplicate.\n found = !compareResult;\n }\n }\n\n return found ? left : -left - 1;\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {TypedArray} from './types';\nimport {binaryInsert} from './non_max_suppression_util';\n\n/*\n * Implementation of the NonMaxSuppression kernel shared between webgl and cpu.\n */\ninterface Candidate {\n  score: number;\n  boxIndex: number;\n  suppressBeginIndex: number;\n}\n\ninterface NonMaxSuppressionResult {\n  selectedIndices: number[];\n  selectedScores?: number[];\n  validOutputs?: number;\n}\n\nexport function\n  nonMaxSuppressionV3Impl(\n    boxes: TypedArray, scores: TypedArray, maxOutputSize: number,\n    iouThreshold: number, scoreThreshold: number): NonMaxSuppressionResult {\n  return\n    nonMaxSuppressionImpl_(\n      boxes, scores, maxOutputSize, iouThreshold, scoreThreshold,\n      0 /*\n      softNmsSigma */);\n}\n\nexport function nonMaxSuppressionV4Impl(\n  boxes: TypedArray, scores: TypedArray,\n  maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n  padToMaxOutputSize: boolean):\n  NonMaxSuppressionResult {\n  return nonMaxSuppressionImpl_(\n    boxes, scores, maxOutputSize,\n    iouThreshold, scoreThreshold,\n    0 /* softNmsSigma */, false /* returnScoresTensor */,\n    padToMaxOutputSize /* padToMaxOutputSize */, true\n    /* returnValidOutputs */);\n}\n\nexport function\n  nonMaxSuppressionV5Impl(\n    boxes: TypedArray, scores: TypedArray, maxOutputSize: number,\n    iouThreshold: number, scoreThreshold: number,\n    softNmsSigma: number): NonMaxSuppressionResult {\n  return nonMaxSuppressionImpl_(\n    boxes, scores, maxOutputSize, iouThreshold, scoreThreshold,\n    softNmsSigma,\n    true /* returnScoresTensor */);\n}\n\nfunction nonMaxSuppressionImpl_(\n  boxes:\n  TypedArray, scores: TypedArray, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n  softNmsSigma: number,\n  returnScoresTensor = false, padToMaxOutputSize = false,\n  returnValidOutputs =\n  false): NonMaxSuppressionResult {\n  // The list is sorted in ascending order, so that we can always pop the\n  // candidate with the largest score in O(1) time.\n  const candidates = [];\n  for (let i = 0; i < scores.length; i++) {\n    if (scores[i] > scoreThreshold) {\n      candidates.push({score: scores[i], boxIndex: i, suppressBeginIndex: 0});\n    }\n  }\n  candidates.sort(ascendingComparator);\n  // If softNmsSigma is 0, the outcome of this algorithm is\n  // exactly same as\n  // before.\n  const scale = softNmsSigma > 0 ? (-0.5 / softNmsSigma) : 0.0;\n  const\n  selectedIndices: number[] = [];\n  const selectedScores: number[] = [];\n  while (selectedIndices.length <\n    maxOutputSize && candidates.length > 0) {\n    const candidate = candidates.pop();\n    const {score: originalScore,\n    boxIndex, suppressBeginIndex} = candidate;\n    if (originalScore < scoreThreshold) {\n      break;\n    }\n    //\n    // Overlapping boxes are likely to have similar scores, therefore we\n    // iterate through the previously selected boxes\n    // backwards in order to\n    // see if candidate's score should be suppressed. We use\n    // suppressBeginIndex to track\n    // and ensure a candidate can be suppressed\n    // by a selected box no more than once. Also, if the overlap exceeds\n    // iouThreshold, we simply ignore the candidate.\n    let ignoreCandidate = false;\n    for (let j =\n    selectedIndices.length - 1; j >= suppressBeginIndex; --j) {\n      const iou = intersectionOverUnion(boxes, boxIndex,\n    selectedIndices[j]);\n      if (iou >= iouThreshold) {\n        ignoreCandidate = true;\n        break;\n      }\n      candidate.score =\n        candidate.score * suppressWeight(iouThreshold, scale, iou);\n      if (candidate.score <=\n    scoreThreshold) {\n        break;\n      }\n    }\n    // At this point, if `candidate.score` has not dropped below\n    // `scoreThreshold`, then we know that we went through all of the\n    // previous selections and can safely update\n    // `suppressBeginIndex` to the\n    // end of the selected array. Then we can re-insert the candidate with\n    // the\n    // updated score and suppressBeginIndex back in the candidate list.\n    // If on the other hand, `candidate.score` has\n    // dropped below the score\n    // threshold, we will not add it back to the candidates list.\n    candidate.suppressBeginIndex = selectedIndices.length;\n    if (!ignoreCandidate) {\n      // Candidate has passed\n      // all the tests, and is not suppressed, so\n      // select the candidate.\n      if (candidate.score === originalScore) {\n        selectedIndices.push(boxIndex);\n        selectedScores.push(candidate.score);\n      } else if (candidate.score >\n    scoreThreshold) {\n        // Candidate's score is suppressed but is still high enough to be\n        // considered, so add\n        // back to the candidates list.\n        binaryInsert(candidates, candidate, ascendingComparator);\n      }\n    }\n  }\n  //\n  // NonMaxSuppressionV4 feature: padding output to maxOutputSize.\n  const validOutputs = selectedIndices.length;\n}
```



```

nonMaxSuppSanityCheck(\n  $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold);\n maxOutputSize
= inputs.maxOutputSize;\n iouThreshold = inputs.iouThreshold;\n scoreThreshold = inputs.scoreThreshold;\n\n
const boxesAndScores = await Promise.all([$boxes.data(), $scores.data()]);\n const boxesVals =
boxesAndScores[0];\n const scoresVals = boxesAndScores[1];\n\n // We call a cpu based impl directly with the
typedarray data here rather\n // than a kernel because all kernels are synchronous (and thus cannot await\n //
.data()).\n const {selectedIndices} = nonMaxSuppressionV3Impl(\n  boxesVals, scoresVals, maxOutputSize,
iouThreshold, scoreThreshold);\n if ($boxes !== boxes) {\n  $boxes.dispose();\n }\n if ($scores !== scores) {\n
$scores.dispose();\n }\n\n return tensor1d(selectedIndices, 'int32');\n}\n\nexport const nonMaxSuppressionAsync =
nonMaxSuppressionAsync_;\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====*\n\nimport {ENGINE} from '../engine';\nimport {NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs} from '../kernel_names';\nimport {NamedAttrMap} from
'../kernel_registry';\nimport {Tensor, Tensor1D, Tensor2D} from '../tensor';\nimport {NamedTensorMap} from
'../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
'../types';\nimport {nonMaxSuppSanityCheck} from './nonmax_util';\nimport {op} from './operation';\n\n/**\n * Performs non maximum suppression of bounding boxes based on\n * iou (intersection over union).\n *\n * This op
also supports a Soft-NMS mode (c.f.\n * Bodla et al, https://arxiv.org/abs/1704.04503) where boxes reduce the
score\n * of other overlapping boxes, therefore favoring different regions of the image\n * with high scores. To
enable this Soft-NMS mode, set the `softNmsSigma`\n * parameter to be larger than 0.\n *\n * @param boxes a 2d
tensor of shape `[numBoxes, 4]`. Each entry is\n * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the
corners of\n * the bounding box.\n *\n * @param scores a 1d tensor providing the box scores of shape
`[numBoxes]`.\n *\n * @param maxOutputSize The maximum number of boxes to be selected.\n *\n * @param
iouThreshold A float representing the threshold for deciding whether\n * boxes overlap too much with respect to
IOU. Must be between [0, 1].\n *\n * Defaults to 0.5 (50% box overlap).\n *\n * @param scoreThreshold A threshold for
deciding when to remove boxes based\n * on score. Defaults to -inf, which means any score is accepted.\n *\n *
@param softNmsSigma A float representing the sigma parameter for Soft NMS.\n * When sigma is 0, it falls
back to nonMaxSuppression.\n *\n * @return A map with the following properties:\n * - selectedIndices: A 1D tensor
with the selected box indices.\n * - selectedScores: A 1D tensor with the corresponding scores for each\n *
selected box.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction
nonMaxSuppressionWithScore_(\n  boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n  maxOutputSize: number, iouThreshold = 0.5,\n  scoreThreshold = Number.NEGATIVE_INFINITY,\n  softNmsSigma = 0.0): NamedTensorMap {\n  const $boxes = convertToTensor(boxes, 'boxes',
'nonMaxSuppression');\n  const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');\n\n  const
params = nonMaxSuppSanityCheck(\n    $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\n    softNmsSigma);\n  maxOutputSize = params.maxOutputSize;\n  iouThreshold = params.iouThreshold;\n  scoreThreshold = params.scoreThreshold;\n  softNmsSigma = params.softNmsSigma;\n\n  const inputs:
NonMaxSuppressionV5Inputs = {boxes: $boxes, scores: $scores};\n  const attrs: NonMaxSuppressionV5Attrs =\n  {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma};\n\n  // tslint:disable-next-line: no-unnecessary-
type-assertion\n  const result = ENGINE.runKernel(\n    NonMaxSuppressionV5, inputs as {} as
NamedTensorMap,\n    attrs as {} as NamedAttrMap) as Tensor[];\n\n  return {selectedIndices: result[0],
selectedScores: result[1]};\n}\n\nexport const nonMaxSuppressionWithScore =
op({nonMaxSuppressionWithScore_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights

```

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```
=====\n\n *\\nimport {nonMaxSuppressionV5Impl} from '.././backends/non_max_suppression_impl';\\nimport {Tensor1D, Tensor2D} from '.././tensor';\\nimport {NamedTensorMap} from '.././tensor_types';\\nimport {convertToTensor} from '.././tensor_util_env';\\nimport {TensorLike} from '.././types';\\nimport {nonMaxSupSanityCheck} from './nonmax_util';\\nimport {tensor1d} from './tensor1d';\\n\\n/**\\n * Asynchronously performs non maximum suppression of bounding boxes based on\\n * iou (intersection over union).\\n * This op also supports a Soft-NMS mode (c.f.\\n * Bodla et al, https://arxiv.org/abs/1704.04503) where boxes reduce the score\\n * of other overlapping boxes, therefore favoring different regions of the image\\n * with high scores. To enable this Soft-NMS mode, set the `softNmsSigma`\\n * parameter to be larger than 0.\\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\\n * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\\n * the bounding box.\\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\\n * @param maxOutputSize The maximum number of boxes to be selected.\\n * @param iouThreshold A float representing the threshold for deciding whether\\n * boxes overlap too much with respect to IOU. Must be between [0, 1].\\n * Defaults to 0.5 (50% box overlap).\\n * @param scoreThreshold A threshold for deciding when to remove boxes based\\n * on score. Defaults to -inf, which means any score is accepted.\\n * @param softNmsSigma A float representing the sigma parameter for Soft NMS.\\n * When sigma is 0, it falls back to nonMaxSuppression.\\n * @return A map with the following properties:\\n * - selectedIndices: A 1D tensor with the selected box indices.\\n * - selectedScores: A 1D tensor with the corresponding scores for each\\n * selected box.\\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\\n */\\n\\n@nasync function nonMaxSuppressionWithScoreAsync_(\\n boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\\n maxOutputSize: number, iouThreshold = 0.5,\\n scoreThreshold = Number.NEGATIVE_INFINITY,\\n softNmsSigma = 0.0): Promise<NamedTensorMap> {\\n const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppressionAsync');\\n const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppressionAsync');\\n\\n const params = nonMaxSupSanityCheck(\\n $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\\n softNmsSigma);\\n maxOutputSize = params.maxOutputSize;\\n iouThreshold = params.iouThreshold;\\n scoreThreshold = params.scoreThreshold;\\n softNmsSigma = params.softNmsSigma;\\n\\n const boxesAndScores = await Promise.all([$boxes.data(), $scores.data()]);\\n const boxesVals = boxesAndScores[0];\\n const scoresVals = boxesAndScores[1];\\n\\n // We call a cpu based impl directly with the typedarray data here rather\\n // than a kernel because all kernels are synchronous (and thus cannot await\\n // .data()).\\n const {selectedIndices, selectedScores} = nonMaxSuppressionV5Impl(\\n boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold,\\n softNmsSigma);\\n\\n if ($boxes !== boxes) {\\n $boxes.dispose();\\n }\\n if ($scores !== scores) {\\n $scores.dispose();\\n }\\n\\n return {\\n selectedIndices: tensor1d(selectedIndices, 'int32'),\\n selectedScores: tensor1d(selectedScores)\\n };\\n}\\n\\nexport const nonMaxSuppressionWithScoreAsync = nonMaxSuppressionWithScoreAsync_;\\n"}\\n\\n * @license\\n * Copyright 2020 Google LLC. All Rights Reserved.\\n * Licensed under the Apache License, Version 2.0 (the \"License\");\\n * you may not use this file except in compliance with the License.\\n * You may obtain a copy of the License at\\n * http://www.apache.org/licenses/LICENSE-2.0\\n * Unless required by applicable law or agreed to in writing, software\\n * distributed under the License is distributed on an \"AS IS\" BASIS,\\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\\n * See the License for the specific language governing permissions and\\n * limitations under the License.\\n *
```

```
=====\n\n *\\nimport {ENGINE} from '.././engine';\\nimport {NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs} from '.././kernel_names';\\nimport {NamedAttrMap} from
```

```

'././kernel_registry';\nimport {Tensor, Tensor1D, Tensor2D} from '././tensor';\nimport {NamedTensorMap} from
'././tensor_types';\nimport {convertToTensor} from '././tensor_util_env';\nimport {TensorLike} from
'././types';\nimport {nonMaxSuppSanityCheck} from './nonmax_util';\nimport {op} from './operation';\n\n/**\n
 * Asynchronously performs non maximum suppression of bounding boxes based on\n
 * iou (intersection over union), with an option to pad results.\n
 * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n
 * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n
 * the bounding box.\n
 * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n
 * @param maxOutputSize The maximum number of boxes to be selected.\n
 * @param iouThreshold A float representing the threshold for deciding whether\n
 * boxes overlap too much with respect to IOU. Must be between [0, 1].\n
 * Defaults to 0.5 (50% box overlap).\n
 * @param scoreThreshold A threshold for deciding when to remove boxes based\n
 * on score. Defaults to -inf, which means any score is accepted.\n
 * @param padToMaxOutputSize Defaults to false. If true, size of output\n
 * `selectedIndices` is padded to maxOutputSize.\n
 * @return A map with the following properties:\n
 * - selectedIndices: A 1D tensor with the selected box indices.\n
 * - validOutputs: A scalar denoting how many elements in `selectedIndices`\n
 * are valid. Valid elements occur first, then padding.\n
 */\n
@doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n
function nonMaxSuppressionPadded_(\n
boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n
maxOutputSize: number, iouThreshold = 0.5,\n
scoreThreshold = Number.NEGATIVE_INFINITY,\n
padToMaxOutputSize = false): NamedTensorMap {\n
const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppression');\n
const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');\n
const params = nonMaxSuppSanityCheck(\n
$boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\n
null /* softNmsSigma */);\n
const $maxOutputSize = params.maxOutputSize;\n
const $iouThreshold = params.iouThreshold;\n
const $scoreThreshold = params.scoreThreshold;\n
const inputs: NonMaxSuppressionV4Inputs = {boxes: $boxes, scores: $scores};\n
const attrs: NonMaxSuppressionV4Attrs = {\n
maxOutputSize: $maxOutputSize,\n
iouThreshold: $iouThreshold,\n
scoreThreshold: $scoreThreshold,\n
padToMaxOutputSize\n
};\n
// tslint:disable-next-line: no-unnecessary-type-assertion\n
const result = ENGINE.runKernel(\n
NonMaxSuppressionV4, inputs as {} as NamedTensorMap,\n
attrs as {} as NamedAttrMap) as Tensor[];\n
return {selectedIndices: result[0], validOutputs: result[1]};\n
}\n
export const nonMaxSuppressionPadded =\n
op({nonMaxSuppressionPadded_});\n
"/**\n
 * @license\n
 * Copyright 2020 Google LLC. All Rights Reserved.\n
 * Licensed under the Apache License, Version 2.0 (the "License");\n
 * you may not use this file except in compliance with the License.\n
 * You may obtain a copy of the License at\n
 * http://www.apache.org/licenses/LICENSE-2.0\n
 * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an "AS IS" BASIS,\n
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the License for the specific language governing permissions and\n
 * limitations under the License.\n
 */\n
=====\n
 *\nimport {nonMaxSuppressionV4Impl} from '././backends/non_max_suppression_impl';\nimport {Tensor1D, Tensor2D} from '././tensor';\nimport {NamedTensorMap} from '././tensor_types';\nimport {convertToTensor} from '././tensor_util_env';\nimport {TensorLike} from '././types';\nimport {nonMaxSuppSanityCheck} from './nonmax_util';\nimport {scalar} from '././scalar';\nimport {tensor1d} from '././tensor1d';\n\n/**\n
 * Asynchronously performs non maximum suppression of bounding boxes based on\n
 * iou (intersection over union), with an option to pad results.\n
 * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n
 * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n
 * the bounding box.\n
 * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n
 * @param maxOutputSize The maximum number of boxes to be selected.\n
 * @param iouThreshold A float representing the threshold for deciding whether\n
 * boxes overlap too much with respect to IOU. Must be between [0, 1].\n
 * Defaults to 0.5 (50% box overlap).\n
 * @param scoreThreshold A threshold for deciding when to remove boxes based\n
 * on score. Defaults to -inf, which means any score is accepted.\n
 * @param padToMaxOutputSize Defaults to false. If true, size of output\n
 * `selectedIndices` is padded to maxOutputSize.\n
 * @return A map with the following properties:\n
 * -

```


NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const resizeBilinear = op({resizeBilinear_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {ResizeNearestNeighbor, ResizeNearestNeighborAttrs, ResizeNearestNeighborInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * NearestNeighbor resize a batch of 3D images to a new shape.\n * @param images The images, of rank 4 or rank 3, of shape\n *   `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param size The new shape `[newHeight, newWidth]` to resize the\n *   images to. Each channel is resized individually.\n * @param alignCorners Defaults to False. If true, rescale\n *   input by `(new_height - 1) / (height - 1)`, which exactly aligns the\n *   corners of images and resized images. If false, rescale by\n *   `new_height / height`. Treat similarly the width dimension.\n * @param halfPixelCenters Defaults to `false`. Whether to assume\n *   pixels are of half the actual dimensions, and yields more accurate\n *   resizes. This flag would also make the floating point coordinates of\n *   the top left pixel 0.5, 0.5.\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction resizeNearestNeighbor_<T extends Tensor3D|Tensor4D>(\n  images: T|TensorLike, size: [number, number], alignCorners = false,\n  halfPixelCenters = false): T {\n  const $images = convertToTensor(images, 'images', 'resizeNearestNeighbor');\n  util.assert($images.rank === 3 || $images.rank === 4,\n    () => `Error in resizeNearestNeighbor: x must be rank 3 or 4, but got ` +\n      `rank ${$images.rank}.`);\n  util.assert(size.length === 2,\n    () => `Error in resizeNearestNeighbor: new shape must 2D, but got shape ` +\n      `${size}.`);\n  util.assert($images.dtype === 'float32' || $images.dtype === 'int32',\n    () => `images` must have `int32` or `float32` as dtype`);\n  util.assert(halfPixelCenters === false || alignCorners === false,\n    () => `Error in resizeNearestNeighbor: If halfPixelCenters is true, ` +\n      `alignCorners must be false.`);\n  let batchImages = $images as Tensor4D;\n  let reshapedTo4D = false;\n  if ($images.rank === 3) {\n    reshapedTo4D = true;\n    batchImages = reshape($images, [1, $images.shape[0], $images.shape[1], $images.shape[2]]);\n  }\n  const [] = size;\n  const inputs: ResizeNearestNeighborInputs = {images: batchImages};\n  const attrs: ResizeNearestNeighborAttrs = {alignCorners, halfPixelCenters, size};\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  const res = ENGINE.runKernel(\n    ResizeNearestNeighbor, inputs as {} as NamedTensorMap,\n    attrs as {} as NamedAttrMap) as T;\n  if (reshapedTo4D) {\n    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n  }\n  return res;\n}\n\nexport const resizeNearestNeighbor = op({resizeNearestNeighbor_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assert} from '../util';\nimport {greaterEqual} from './greater_equal';\nimport {lessEqual} from './less_equal';\nimport {logicalAnd} from './logical_and';\nimport {op}
```

```

from './operation';\nimport {range} from './range';\nimport {reshape} from './reshape';\nimport {scalar} from
 './scalar';\nimport {stack} from './stack';\nimport {sub} from './sub';\nimport {unstack} from './unstack';\nimport
 {where} from './where';\nimport {zeros} from './zeros';\n\n**\n * Copy a tensor setting everything outside a
 central band in each innermost\n * matrix to zero.\n *\n * The band part is computed as follows: Assume input has
 `k` dimensions\n * `[I, J, K, ..., M, N]`, then the output is a tensor with the same shape where\n * `band[i, j, k, ..., m,
 n] = in_band(m, n) * input[i, j, k, ..., m, n]`.\n * The indicator function\n * `in_band(m, n) = (num_lower < 0 || (m-n)
 <= num_lower))` \n * `&& (num_upper < 0 || (n-m) <= num_upper)`\n *\n * ``js\n * const x = tf.tensor2d([[ 0, 1,
 2, 3],\n *      [-1, 0, 1, 2],\n *      [-2, -1, 0, 1],\n *      [-3, -2, -1, 0]]);\n * let y =
 tf.linalg.bandPart(x, 1, -1);\n * y.print(); // [[ 0, 1, 2, 3],\n *      // [-1, 0, 1, 2],\n *      // [ 0, -1, 0, 1],\n *
 // [ 0, 0, -1, 0]]\n * let z = tf.linalg.bandPart(x, 2, 1);\n * z.print(); // [[ 0, 1, 0, 0],\n *      // [-1, 0, 1, 0],\n
 *      // [-2, -1, 0, 1],\n *      // [ 0, -2, -1, 0]]\n *\n * @param x Rank `k` tensor\n * @param
 numLower Number of subdiagonals to keep.\n * If negative, keep entire lower triangle.\n * @param numUpper
 Number of subdiagonals to keep.\n * If negative, keep entire upper triangle.\n * @returns Rank `k` tensor of the
 same shape as input.\n * The extracted banded tensor.\n *\n * @doc {heading:'Operations', subheading:'Linear
 Algebra', namespace:'linalg'}\n *\nfunction bandPart_<T extends Tensor>(\n  a: T|TensorLike, numLower:
 number, numUpper: number): T {\n  assert(\n    numLower % 1 === 0,\n    () => `bandPart(): numLower must be
 an integer, got ${numLower}.`);\n  assert(\n    numUpper % 1 === 0,\n    () => `bandPart(): numUpper must be an
 integer, got ${numUpper}.`);\n\n  const $a = convertToTensor(a, 'a', 'bandPart');\n  assert(\n    $a.rank >= 2,\n    () => `bandPart(): Rank must be at least 2, got ${$a.rank}.`);\n\n  const shape = $a.shape;\n  const [M, N] =
 $a.shape.slice(-2);\n  if (!(numLower <= M)) {\n    throw new Error(\n      `bandPart(): numLower
 (${numLower})` +\n      ` must not be greater than the number of rows (${M}).`);\n  }\n  if (!(numUpper <= N))
 {\n    throw new Error(\n      `bandPart(): numUpper (${numUpper})` +\n      ` must not be greater than the
 number of columns (${N}).`);\n  }\n\n  if (numLower < 0) {\n    numLower = M;\n  }\n  if (numUpper < 0) {\n
    numUpper = N;\n  }\n\n  const i = reshape(range(0, M, 1, 'int32'), [-1, 1]);\n  const j = range(0, N, 1, 'int32');\n  const
 ij = sub(i, j);\n  const inBand = logicalAnd(\n    lessEqual(ij, scalar(+numLower, 'int32')), \n    greaterEqual(ij,
 scalar(-numUpper, 'int32')));\n\n  const zero = zeros([M, N], $a.dtype);\n\n  return reshape(\n
    stack(unstack(reshape($a, [-1, M, N]))\n      .map(mat => where(inBand, mat, zero))),\n    shape) as
 T;\n}\n\nexport const bandPart = op({bandPart_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All
 Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
 file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *\n
=====
*\n\nimport {ENGINE} from '././engine';\nimport {Tensor1D, Tensor2D} from '././tensor';\nimport {assert} from
 '././util';\nimport {div} from './div';\nimport {mul} from './mul';\nimport {norm} from './norm';\nimport {op}
 from './operation';\nimport {split} from './split';\nimport {squeeze} from './squeeze';\nimport {stack} from
 './stack';\nimport {sub} from './sub';\nimport {sum} from './sum';\n\n**\n * Gram-Schmidt orthogonalization.\n
*\n * ``js\n * const x = tf.tensor2d([[1, 2], [3, 4]]);\n * let y = tf.linalg.gramSchmidt(x);\n * y.print();\n *
console.log('Orthogonalized:');\n * y.dot(y.transpose()).print(); // should be nearly the identity matrix.\n *
console.log('First row direction maintained:');\n * const data = await y.array();\n * console.log(data[0][1] /
 data[0][0]); // should be nearly 2.\n *\n * @param xs The vectors to be orthogonalized, in one of the two
 following\n * formats:\n * - An Array of `tf.Tensor1D`.\n * - A `tf.Tensor2D`, i.e., a matrix, in which case the
 vectors are the rows\n * of `xs`.\n * In each case, all the vectors must have the same length and the length\n *
must be greater than or equal to the number of vectors.\n * @returns The orthogonalized and normalized vectors or
 matrix.\n * Orthogonalization means that the vectors or the rows of the matrix\n * are orthogonal (zero inner
 products). Normalization means that each\n * vector or each row of the matrix has an L2 norm that equals `1`.\n

```

```

*\n * @doc {heading:'Operations', subheading:'Linear Algebra', namespace:'linalg'}\n *\nfunction
gramSchmidt_(xs: Tensor1D[]|Tensor2D): Tensor1D[]|Tensor2D {\n let inputIsTensor2D: boolean;\n if
(Array.isArray(xs)) {\n inputIsTensor2D = false;\n assert(\n xs != null && xs.length > 0,\n () => 'Gram-
Schmidt process: input must not be null, undefined, or '+\n 'empty');\n const dim = xs[0].shape[0];\n for
(let i = 1; i < xs.length; ++i) {\n assert(\n xs[i].shape[0] === dim,\n () =>\n 'Gram-Schmidt:
Non-unique lengths found in the input vectors: '+\n `(${xs as Tensor1D[]}[i].shape[0]) vs. ${dim}`);\n
}\n } else {\n inputIsTensor2D = true;\n xs = split(xs, xs.shape[0], 0).map(x => squeeze(x, [0]));\n }\n\n
assert(\n xs.length <= xs[0].shape[0],\n () => `Gram-Schmidt: Number of vectors (${xs as
Tensor1D[]}.length) exceeds `+\n `number of dimensions (${xs as Tensor1D[]}[0].shape[0]).`);\n\n const
ys: Tensor1D[] = [];\n const xs1d = xs;\n for (let i = 0; i < xs.length; ++i) {\n ys.push(ENGINE.tidy(() => {\n
let x = xs1d[i];\n if (i > 0) {\n for (let j = 0; j < i; ++j) {\n const proj = mul(sum(mul(ys[j], x)), ys[j]);\n
x = sub(x, proj);\n }\n }\n return div(x, norm(x, 'euclidean'));\n }));\n }\n\n if (inputIsTensor2D)
{\n return stack(ys, 0) as Tensor2D;\n } else {\n return ys;\n }\n}\n\nexport const gramSchmidt =
op({gramSchmidt_});\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\nimport {ENGINE} from '../engine';\nimport {dispose} from '../globals';\nimport {Tensor, Tensor2D} from
'../tensor';\nimport {assert} from '../util';\nimport {clone} from './clone';\nimport {concat} from
'./concat';\nimport {div} from './div';\nimport {eye} from './eye';\nimport {greater} from './greater';\nimport
{matMul} from './mat_mul';\nimport {mul} from './mul';\nimport {neg} from './neg';\nimport {norm} from
'./norm';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {slice} from
'./slice';\nimport {stack} from './stack';\nimport {sub} from './sub';\nimport {tensor2d} from './tensor2d';\nimport
{transpose} from './transpose';\nimport {unstack} from './unstack';\nimport {where} from './where';\n\n/**\n *
Compute QR decomposition of m-by-n matrix using Householder transformation.\n * Implementation based
on\n * [http://www.cs.cornell.edu/~bindel/class/cs6210-f09/lec18.pdf]\n *
(http://www.cs.cornell.edu/~bindel/class/cs6210-f09/lec18.pdf)\n * \n * \n * const a = tf.tensor2d([[1, 2], [3,
4]]);\n * let [q, r] = tf.linalg.qr(a);\n * console.log('Q');\n * q.print();\n * console.log('R');\n * r.print();\n *
console.log('Orthogonalized');\n * q.dot(q.transpose()).print() // should be nearly the identity matrix.\n *
console.log('Reconstructed');\n * q.dot(r).print(); // should be nearly [[1, 2], [3, 4]];\n * \n * \n * @param x The
`tf.Tensor` to be QR-decomposed. Must have rank >= 2. Suppose\n * it has the shape `[..., M, N]`.\n * @param
fullMatrices An optional boolean parameter. Defaults to `false`.\n * If `true`, compute full-sized `Q`. If `false` (the
default),\n * compute only the leading N columns of `Q` and `R`.\n * @returns An `Array` of two `tf.Tensor`s: `[Q,
R]`. `Q` is a unitary matrix,\n * i.e., its columns all have unit norm and are mutually orthogonal.\n * If `M >=
N`,\n * If `fullMatrices` is `false` (default),\n * - `Q` has a shape of `[..., M, N]`,\n * - `R` has a shape of
`[..., N, N]`.\n * If `fullMatrices` is `true` (default),\n * - `Q` has a shape of `[..., M, M]`,\n * - `R` has a
shape of `[..., M, N]`.\n * If `M < N`,\n * - `Q` has a shape of `[..., M, M]`,\n * - `R` has a shape of `[..., M,
N]`.\n * @throws If the rank of `x` is less than 2.\n * \n * @doc {heading:'Operations',\n * subheading:'Linear
Algebra',\n * namespace:'linalg'}\n *\nfunction qr_(x: Tensor, fullMatrices = false): [Tensor, Tensor] {\n
assert(\n x.rank >= 2,\n () => `qr() requires input tensor to have a rank >= 2, but got rank ${\n
x.rank}`);\n\n if (x.rank === 2) {\n return qr2d(x as Tensor2D, fullMatrices);\n } else {\n // Rank > 2.\n //
TODO(cais): Below we split the input into individual 2D tensors,\n // perform QR decomposition on them and
then stack the results back\n // together. We should explore whether this can be parallelized.\n const
outerDimsProd = x.shape.slice(0, x.shape.length - 2)\n .reduce((value, prev) => value * prev);\n

```



```

./scalar';\nimport {sum} from './sum';\n\n/**\n * Computes the weighted loss between two tensors.\n *\n * @param losses Tensor of shape `[batch_size, d1, ... dN]`.\n * @param weights Tensor whose rank is either 0, or the same rank as\n * `losses`, and must be broadcastable to `losses` (i.e., all\n * dimensions must be either `1`, or the same as the corresponding\n * `losses` dimension).\n *\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n *\nfunction computeWeightedLoss_<T extends Tensor, O extends Tensor>(\n losses: T|TensorLike, weights?: Tensor|TensorLike,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $losses = convertToTensor(losses, 'losses', 'computeWeightedLoss');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'computeWeightedLoss');\n }\n\n const weightedLoss = ($weights == null) ? $losses : mul($losses, $weights);\n\n if (reduction === Reduction.NONE) {\n return weightedLoss as O;\n }\n if (reduction === Reduction.SUM) {\n return sum(weightedLoss);\n }\n if (reduction === Reduction.MEAN) {\n if ($weights == null) {\n return mean(weightedLoss);\n }\n else {\n const broadcastFactor = $losses.size / $weights.size;\n const result = div(sum(weightedLoss), sum($weights));\n return broadcastFactor > 1 ? div(result, scalar(broadcastFactor)) :\n result as O;\n }\n }\n\n if (reduction === Reduction.SUM_BY_NONZERO_WEIGHTS) {\n if ($weights == null) {\n return div(sum(weightedLoss), scalar($losses.size));\n }\n else {\n const broadcastedWeights = mul($weights, ones($losses.shape));\n const numNonZeros =\n cast(sum(notEqual(broadcastedWeights, scalar(0))), 'float32');\n return div(sum(weightedLoss), numNonZeros);\n }\n }\n\n throw Error(`Unknown reduction: ${reduction}`);\n }\n\nexport const computeWeightedLoss = op({computeWeightedLoss_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n\nimport {Tensor} from './../tensor';\nimport {convertToTensor} from './../tensor_util_env';\nimport {TensorLike} from './../types';\nimport {assertShapesMatch} from './../util';\nimport {abs} from './abs';\nimport {Reduction} from './loss_ops_utils';\nimport {op} from './operation';\nimport {sub} from './sub';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the absolute difference loss between two tensors.\n *\n * @param labels The ground truth output tensor, same dimensions as\n * 'predictions'.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding `losses`\n * dimension).\n *\n * @param reduction Type of reduction to apply to loss. Should be of type\n * `Reduction`\n *\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n *\nfunction absoluteDifference_<T extends Tensor, O extends Tensor>(\n labels: T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels', 'absoluteDifference');\n const $predictions =\n convertToTensor(predictions, 'predictions', 'absoluteDifference');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'absoluteDifference');\n }\n\n assertShapesMatch($labels.shape, $predictions.shape, 'Error in absoluteDifference:');\n\n const losses = abs(sub($labels, $predictions));\n return computeWeightedLoss(losses, $weights, reduction);\n }\n\nexport const absoluteDifference = op({absoluteDifference_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====
*\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {Reduction} from
'./loss_ops_utils';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {scalar} from
'./scalar';\nimport {sub} from './sub';\nimport {sum} from './sum';\n\nimport {computeWeightedLoss} from
'./compute_weighted_loss';\n\n/**\n * Computes the cosine distance loss between two tensors.\n * @param
labels The ground truth output tensor, same dimensions as\n * `predictions`.\n * @param predictions The predicted
outputs.\n * @param axis The dimension along which the cosine distance is computed.\n * @param weights Tensor
whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n
* must be either `1`, or the same as the corresponding `losses`\n * dimension).\n * @param reduction Type of
reduction to apply to loss. Should be of type\n * `Reduction`\n * @doc {heading: 'Training', subheading:
'Losses', namespace: 'losses'}\n *\nfunction cosineDistance_<T extends Tensor, O extends Tensor>(\n labels:
T|TensorLike, predictions: T|TensorLike, axis: number,\n weights?: Tensor|TensorLike,\n reduction =
Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels',
'cosineDistance');\n const $predictions =\n convertToTensor(predictions, 'predictions', 'cosineDistance');\n let
$weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights',
'cosineDistance');\n }\n assertShapesMatch(\n $labels.shape, $predictions.shape, 'Error in cosineDistance: ');
\n const one = scalar(1);\n const losses = sub(one, sum(mul($labels, $predictions), axis, true));\n return
computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const cosineDistance =
op({cosineDistance_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {Reduction} from
'./loss_ops_utils';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {relu} from
'./relu';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\n\nimport {computeWeightedLoss} from
'./compute_weighted_loss';\n\n/**\n * Computes the Hinge loss between two tensors.\n * @param labels The
ground truth output tensor, same dimensions as\n * `predictions`.\n * @param predictions The predicted outputs.\n
* @param weights Tensor whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to
`labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding `losses`\n * dimension).\n
* @param reduction Type of reduction to apply to loss. Should be of type\n * `Reduction`\n * @doc {heading:
'Training', subheading: 'Losses', namespace: 'losses'}\n *\nfunction hingeLoss_<T extends Tensor, O extends
Tensor>(\n labels: T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike,\n reduction =
Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n let $labels = convertToTensor(labels, 'labels', 'hingeLoss');\n
const $predictions = convertToTensor(predictions, 'predictions', 'hingeLoss');\n let $weights: Tensor = null;\n if
(weights != null) {\n $weights = convertToTensor(weights, 'weights', 'hingeLoss');\n }\n
assertShapesMatch($labels.shape, $predictions.shape, 'Error in hingeLoss: ');
\n const one = scalar(1);\n // Convert binary labels to (-1, 1)\n $labels = sub(mul(scalar(2), $labels), one);\n
const losses = relu(sub(one, mul($labels, $predictions)));
\n return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const
hingeLoss = op({hingeLoss_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

```

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {abs} from './abs';\nimport {add} from './add';\nimport {Reduction} from './loss_ops_utils';\nimport {minimum} from './minimum';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {scalar} from './scalar';\nimport {square} from './square';\nimport {sub} from './sub';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the huber loss between two tensors.\n * @param labels The ground truth output tensor, same dimensions as\n *   `predictions`.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose rank is either 0, or the same rank as\n *   `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n *   must be either `1`, or the same as the corresponding `losses`\n *   dimension).\n * @param delta Point where huber loss changes from quadratic to linear.\n * @param reduction Type of reduction to apply to loss. Should be of type\n *   `Reduction`.\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n */\nfunction huberLoss_<T extends Tensor, O extends Tensor>(\n  labels: T|TensorLike,\n  predictions: T|TensorLike,\n  weights?: Tensor|TensorLike, delta = 1.0,\n  reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n  const $labels = convertToTensor(labels, 'labels', 'huberLoss');\n  const $predictions = convertToTensor(predictions, 'predictions', 'huberLoss');\n  let $weights: Tensor = null;\n  if (weights != null) {\n    $weights = convertToTensor(weights, 'weights', 'huberLoss');\n  }\n  assertShapesMatch($labels.shape, $predictions.shape, 'Error in huberLoss: ');\n  const deltaScalar = scalar(delta);\n  const error = abs(sub($predictions, $labels));\n  const quadratic = minimum(error, deltaScalar);\n  const linear = sub(error, quadratic);\n  const losses =\n    add(mul(scalar(0.5), square(quadratic)),\n    mul(deltaScalar, linear));\n  return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const huberLoss = op({huberLoss_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```
=====\n*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {add} from './add';\nimport {log} from './log';\nimport {Reduction} from './loss_ops_utils';\nimport {mul} from './mul';\nimport {neg} from './neg';\nimport {op} from './operation';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the log loss between two tensors.\n * @param labels The ground truth output tensor, same dimensions as\n *   `predictions`.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose rank is either 0, or the same rank as\n *   `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n *   must be either `1`, or the same as the corresponding `losses`\n *   dimension).\n * @param epsilon A small increment to avoid taking log of zero.\n * @param reduction Type of reduction to apply to loss. Should be of type\n *   `Reduction`.\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n */\nfunction logLoss_<T extends Tensor, O extends Tensor>(\n  labels: T|TensorLike, predictions: T|TensorLike,\n  weights?: Tensor|TensorLike, epsilon = 1e-7,\n  reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n  const $labels = convertToTensor(labels, 'labels', 'logLoss');\n  const $predictions = convertToTensor(predictions, 'predictions', 'logLoss');\n  let $weights: Tensor = null;\n  if (weights != null) {\n    $weights = convertToTensor(weights, 'weights', 'logLoss');\n  }\n  assertShapesMatch($labels.shape, $predictions.shape, 'Error in logLoss: ');\n  const one = scalar(1);\n  const\n
```

```

epsilonScalar = scalar(epsilon);\n\n const l1 = neg(mul($labels, log(add($predictions, epsilonScalar))));\n const l2
=\n  mul(sub(one, $labels), log(add(sub(one, $predictions), epsilonScalar)));\n const losses = sub(l1, l2);\n return
computeWeightedLoss(losses, $weights, reduction);\n}\nexport const logLoss = op({logLoss_});\n"/**\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {Reduction} from
'./loss_ops_utils';\nimport {op} from './operation';\nimport {squaredDifference} from
'./squared_difference';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes
the mean squared error between two tensors.\n * @param labels The ground truth output tensor, same
dimensions as\n * `predictions`.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose
rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n *
must be either `1`, or the same as the corresponding `losses` dimension).\n * @param reduction Type of
reduction to apply to loss. Should be of type\n * `Reduction`\n * @doc {heading: 'Training', subheading:
'Losses', namespace: 'losses'}\n\nfunction meanSquaredError<T extends Tensor, O extends Tensor>(\n labels:
T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike,\n reduction =
Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels',
'meanSquaredError');\n const $predictions =\n  convertToTensor(predictions, 'predictions',
'meanSquaredError');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights =
convertToTensor(weights, 'weights', 'meanSquaredError');\n }\n assertShapesMatch(\n $labels.shape,
$predictions.shape, 'Error in meanSquaredError:');\n\n const losses = squaredDifference($labels, $predictions);\n
return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const meanSquaredError =
op({meanSquaredError_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {abs} from './abs';\nimport
{add} from './add';\nimport {exp} from './exp';\nimport {log1p} from './log1p';\nimport {Reduction} from
'./loss_ops_utils';\nimport {mul} from './mul';\nimport {neg} from './neg';\nimport {op} from
'./operation';\nimport {relu} from './relu';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\n\nimport
{computeWeightedLoss} from './compute_weighted_loss';\n\nfunction sigmoidCrossEntropyWithLogits<T
extends Tensor, O extends Tensor>(\n labels: T|TensorLike, logits: T|TensorLike): O {\n const $labels =\n
convertToTensor(labels, 'labels', 'sigmoidCrossEntropyWithLogits');\n const $logits =\n  convertToTensor(logits,
'logits', 'sigmoidCrossEntropyWithLogits');\n assertShapesMatch(\n $labels.shape, $logits.shape, 'Error in
sigmoidCrossEntropyWithLogits:');\n\n /**\n * Implementation Details:\n * For brevity, let `x = logits`, `z
= labels`. The logistic loss is\n *  $z * -\log(\text{sigmoid}(x)) + (1 - z) * -\log(1 - \text{sigmoid}(x))$ \n *
 $= z * -\log(1 / (1 + \exp(-x))) + (1 - z) * -\log(\exp(-x) / (1 + \exp(-x)))$ \n *
 $= z * \log(1 + \exp(-x)) + (1 - z) * (-\log(\exp(-x)) + \log(1 + \exp(-x)))$ \n *
 $= z * \log(1 + \exp(-x)) + (1 - z) * (x + \log(1 + \exp(-x)))$ \n *
 $= (1 - z) * x + \log(1 + \exp(-x))$ \n *

```

$x - x * z + \log(1 + \exp(-x))$ For $x < 0$, to avoid overflow in $\exp(-x)$, we reformulate the above
 $x * z + \log(1 + \exp(-x)) = \log(\exp(x)) - x * z + \log(1 + \exp(-x)) = -x * z + \log(1 + \exp(x))$
Hence, to ensure stability and avoid overflow, the implementation uses this equivalent formulation:
 $\max(x, 0) - x * z + \log(1 + \exp(-\text{abs}(x)))$
const maxOutput = relu(\$logits);
const outputXTarget = mul(\$logits, \$labels);
const sigmoidOutput = log1p(exp(neg(abs(\$logits))));
return add(sub(maxOutput, outputXTarget), sigmoidOutput);
Computes the sigmoid cross entropy loss between two tensors.
If labelSmoothing is nonzero, smooth the labels towards 1/2:
newMulticlassLabels = multiclassLabels * (1 - labelSmoothing) + 0.5 * labelSmoothing
@param multiClassLabels The ground truth output tensor of shape [batch_size, num_classes], same dimensions as 'predictions'.
@param logits The predicted outputs.
@param weights Tensor whose rank is either 0, or the same rank as 'labels', and must be broadcastable to 'labels' (i.e., all dimensions must be either 1, or the same as the corresponding 'losses' dimension).
@param labelSmoothing If greater than 0, then smooth the labels.
@param reduction Type of reduction to apply to loss. Should be of type 'Reduction'.
@doc { heading: 'Training', subheading: 'Losses', namespace: 'losses' }
function sigmoidCrossEntropy<T extends Tensor, O extends Tensor>(multiClassLabels: T|TensorLike, logits: T|TensorLike, weights?: Tensor|TensorLike, labelSmoothing = 0, reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {
let \$multiClassLabels = convertToTensor(multiClassLabels, 'multiClassLabels', 'sigmoidCrossEntropy');
const \$logits = convertToTensor(logits, 'logits', 'sigmoidCrossEntropy');
let \$weights: Tensor = null;
if (weights != null) {
\$weights = convertToTensor(weights, 'weights', 'sigmoidCrossEntropy');
} assertShapesMatch(\$multiClassLabels.shape, \$logits.shape, 'Error in sigmoidCrossEntropy: ');
if (labelSmoothing > 0) {
const labelSmoothingScalar = scalar(labelSmoothing);
const one = scalar(1);
const half = scalar(0.5);
\$multiClassLabels = add(mul(\$multiClassLabels, sub(one, labelSmoothingScalar)), mul(half, labelSmoothingScalar));
} const losses = sigmoidCrossEntropyWithLogits_(\$multiClassLabels, \$logits);
return computeWeightedLoss(losses, \$weights, reduction);
}
export const sigmoidCrossEntropy = op({sigmoidCrossEntropy_});
"/**
@license Copyright 2020 Google LLC. All Rights Reserved.
Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at
http://www.apache.org/licenses/LICENSE-2.0
Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and limitations under the License.*/
=====
import { customGrad } from '../gradients';
import { Tensor } from '../tensor';
import { GradSaveFunc } from '../tensor_types';
import { convertToTensor } from '../tensor_util_env';
import { TensorLike } from '../types';
import { assertShapesMatch } from '../util';
import { add } from './add';
import { expandShapeToKeepDim } from './axis_util';
import { cast } from './cast';
import { div } from './div';
import { exp } from './exp';
import { logSumExp } from './log_sum_exp';
import { Reduction } from './loss_ops_utils';
import { mul } from './mul';
import { neg } from './neg';
import { op } from './operation';
import { reshape } from './reshape';
import { scalar } from './scalar';
import { sub } from './sub';
import { sum } from './sum';
import { computeWeightedLoss } from './compute_weighted_loss';
Computes softmax cross entropy between logits and labels.
Measures the probability error in discrete classification tasks in which the classes are mutually exclusive (each entry is in exactly one class).
For example, each CIFAR-10 image is labeled with one and only one label: an image can be a dog or a truck, but not both.
NOTE: While the classes are mutually exclusive, their probabilities need not be. All that is required is that each row of labels is a valid probability distribution. If they are not, the computation of the gradient will be incorrect.
WARNING: This op expects unscaled logits, since it performs a softmax on logits internally for efficiency. Do not call this op with the output of softmax, as it will produce incorrect results.
logits and labels must have the same shape, e.g. [batch_size, num_classes] and the same dtype.

```

* @param labels The labels array.\n * @param logits The logits array.\n * @param dim The dimension softmax
would be performed on. Defaults to -1\n * which indicates the last dimension.\n */\nfunction
softmaxCrossEntropyWithLogits_<T extends Tensor, O extends Tensor>(\n  labels: T, logits: T, dim = -1): O {\n
if (dim === -1) {\n  dim = logits.rank - 1;\n }\n\n if (dim !== logits.rank - 1) {\n  throw Error(\n    `Softmax
cross entropy along a non-last dimension is not yet ` +\n    `supported. Labels / logits was rank ${logits.rank} `
+\n    `and dim was ${dim}`);\n }\n // Use a custom gradient for numerical stability.\n const customOp =\n customGrad((labels: Tensor, logits: Tensor, save: GradSaveFunc) => {\n   // Reference:\n   // 1.
http://cs231n.github.io/linear-classify/#softmax\n   // 2. https://blog.feedly.com/tricks-of-the-trade-logsumexp/\n
const keepDims = true;\n const lse = logSumExp(logits, [dim], keepDims);\n const logResult =
sub(cast(logits, 'float32'), lse);\n save([[labels, logResult]]);\n\n const costVector = neg(mul(logResult,
labels));\n const value: O = sum(costVector, [dim]);\n\n const gradFunc = (dy: O, saved: Tensor[]) => {\n
const [labels, logResult] = saved;\n const dyShape = expandShapeToKeepDim(dy.shape, [dim]);\n
return [\n   mul(reshape(dy, dyShape),\n     sub(cast(labels, 'float32'), exp(logResult))),\n
mul(reshape(dy, dyShape),\n     sub(exp(logResult), cast(labels, 'float32'))),\n   ];\n   };\n return
{value, gradFunc};\n });\n\n return customOp(labels, logits);\n }\n\n**\n * Computes the softmax cross entropy
loss between two tensors.\n *\n * If labelSmoothing is nonzero, smooth the labels towards 1/2:\n *\n *
newOnehotLabels = onehotLabels * (1 - labelSmoothing)\n * + labelSmoothing / numClasses\n *\n *
@param onehotLabels One hot encoded labels\n * [batch_size, num_classes], same dimensions as 'predictions'.\n
*\n * @param logits The predicted outputs.\n * @param weights Tensor whose rank is either 0, or 1, and must be\n *
broadcastable to `loss` of shape [batch_size]\n * @param labelSmoothing If greater than 0, then smooth the
labels.\n * @param reduction Type of reduction to apply to loss. Should be of type\n * `Reduction`\n *\n * @doc
{ heading: 'Training', subheading: 'Losses', namespace: 'losses' }\n */\nfunction softmaxCrossEntropy_<T extends
Tensor, O extends Tensor>(\n  onehotLabels: T|TensorLike, logits: T|TensorLike,\n  weights?:
Tensor|TensorLike, labelSmoothing = 0,\n  reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n let
$onehotLabels =\n convertToTensor(onehotLabels, 'onehotLabels', 'softmaxCrossEntropy');\n const $logits =
convertToTensor(logits, 'logits', 'softmaxCrossEntropy');\n let $weights: Tensor = null;\n\n if (weights !== null) {\n
$weights = convertToTensor(weights, 'weights', 'softmaxCrossEntropy');\n }\n\n assertShapesMatch(\n
$onehotLabels.shape, $logits.shape, 'Error in softmaxCrossEntropy: ');\n\n if (labelSmoothing > 0) {\n const
labelSmoothingScalar = scalar(labelSmoothing);\n const one = scalar(1);\n const numClasses =
scalar($onehotLabels.shape[1]);\n\n $onehotLabels =\n add(mul($onehotLabels, sub(one,
labelSmoothingScalar)),\n   div(labelSmoothingScalar, numClasses));\n }\n\n const losses =
softmaxCrossEntropyWithLogits_($onehotLabels, $logits);\n\n return computeWeightedLoss(losses, $weights,
reduction);\n }\n\nexport const softmaxCrossEntropy = op({softmaxCrossEntropy_});\n\n**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
`License`);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an `AS IS` BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\n// Modularized ops.\nexport {abs} from './abs';\nexport {acos} from './acos';\nexport {acosh} from
 './acosh';\nexport {add} from './add';\nexport {addN} from './add_n';\nexport {all} from './all';\nexport {any} from
 './any';\nexport {argMax} from './arg_max';\nexport {argMin} from './arg_min';\nexport {asin} from './asin';\nexport
 {asinh} from './asinh';\nexport {atan} from './atan';\nexport {atan2} from './atan2';\nexport {atanh} from
 './atanh';\nexport {avgPool} from './avg_pool';\nexport {avgPool3d} from './avg_pool_3d';\nexport
 {basicLSTMCell} from './basic_lstm_cell';\nexport {batchToSpaceND} from './batch_to_space_nd';\nexport
 {batchNorm} from './batchnorm';\nexport {batchNorm2d} from './batchnorm2d';\nexport {batchNorm3d} from
 './batchnorm3d';\nexport {batchNorm4d} from './batchnorm4d';\nexport {bincount} from './bincount';\nexport

```

{broadcastTo} from './broadcast_to';\nexport {buffer} from './buffer';\nexport {cast} from './cast';\nexport {ceil} from './ceil';\nexport {clipByValue} from './clip_by_value';\nexport {clone} from './clone';\nexport {complex} from './complex';\nexport {concat} from './concat';\nexport {concat1d} from './concat_1d';\nexport {concat2d} from './concat_2d';\nexport {concat3d} from './concat_3d';\nexport {concat4d} from './concat_4d';\nexport {conv1d} from './conv1d';\nexport {conv2d} from './conv2d';\nexport {conv2dTranspose} from './conv2d_transpose';\nexport {conv3d} from './conv3d';\nexport {conv3dTranspose} from './conv3d_transpose';\nexport {cos} from './cos';\nexport {cosh} from './cosh';\nexport {cumsum} from './cumsum';\nexport {denseBincount} from './dense_bincount';\nexport {depthToSpace} from './depth_to_space';\nexport {depthwiseConv2d} from './depthwise_conv2d';\nexport {diag} from './diag';\nexport {dilation2d} from './dilation2d';\nexport {div} from './div';\nexport {divNoNaN} from './div_no_nan';\nexport {dot} from './dot';\nexport {elu} from './elu';\nexport {equal} from './equal';\nexport {erf} from './erf';\nexport {exp} from './exp';\nexport {expandDims} from './expand_dims';\nexport {expm1} from './expm1';\nexport {eye} from './eye';\nexport {fill} from './fill';\nexport {floor} from './floor';\nexport {floorDiv} from './floorDiv';\nexport {gather} from './gather';\nexport {greater} from './greater';\nexport {greaterEqual} from './greater_equal';\nexport {imag} from './imag';\nexport {isFinite} from './is_finite';\nexport {isInf} from './is_inf';\nexport {isNaN} from './is_nan';\nexport {leakyRelu} from './leaky_relu';\nexport {less} from './less';\nexport {lessEqual} from './less_equal';\nexport {linspace} from './linspace';\nexport {localResponseNormalization} from './local_response_normalization';\nexport {log} from './log';\nexport {log1p} from './log1p';\nexport {logSigmoid} from './log_sigmoid';\nexport {logSoftmax} from './log_softmax';\nexport {logSumExp} from './log_sum_exp';\nexport {logicalAnd} from './logical_and';\nexport {logicalNot} from './logical_not';\nexport {logicalOr} from './logical_or';\nexport {logicalXor} from './logical_xor';\nexport {matMul} from './mat_mul';\nexport {max} from './max';\nexport {maxPool} from './max_pool';\nexport {maxPool3d} from './max_pool_3d';\nexport {maxPoolWithArgmax} from './max_pool_with_argmax';\nexport {maximum} from './maximum';\nexport {mean} from './mean';\nexport {min} from './min';\nexport {minimum} from './minimum';\nexport {mirrorPad} from './mirror_pad';\nexport {mod} from './mod';\nexport {moments} from './moments';\nexport {mul} from './mul';\nexport {LSTMCellFunc, multiRNNCell} from './multi_rnn_cell';\nexport {multinomial} from './multinomial';\nexport {neg} from './neg';\nexport {notEqual} from './not_equal';\nexport {oneHot} from './one_hot';\nexport {ones} from './ones';\nexport {onesLike} from './ones_like';\nexport {outerProduct} from './outer_product';\nexport {pad} from './pad';\nexport {pad1d} from './pad1d';\nexport {pad2d} from './pad2d';\nexport {pad3d} from './pad3d';\nexport {pad4d} from './pad4d';\nexport {pool} from './pool';\nexport {pow} from './pow';\nexport {prelu} from './prelu';\nexport {print} from './print';\nexport {prod} from './prod';\nexport {rand} from './rand';\nexport {randomGamma} from './random_gamma';\nexport {randomNormal} from './random_normal';\nexport {randomUniform} from './random_uniform';\nexport {range} from './range';\nexport {real} from './real';\nexport {reciprocal} from './reciprocal';\nexport {relu} from './relu';\nexport {relu6} from './relu6';\nexport {reshape} from './reshape';\nexport {reverse} from './reverse';\nexport {reverse1d} from './reverse_1d';\nexport {reverse2d} from './reverse_2d';\nexport {reverse3d} from './reverse_3d';\nexport {reverse4d} from './reverse_4d';\nexport {round} from './round';\nexport {rsqrt} from './rsqrt';\nexport {scalar} from './scalar';\nexport {selu} from './selu';\nexport {separableConv2d} from './separable_conv2d';\nexport {setdiff1dAsync} from './setdiff1d_async';\nexport {sigmoid} from './sigmoid';\nexport {sign} from './sign';\nexport {sin} from './sin';\nexport {sinh} from './sinh';\nexport {slice} from './slice';\nexport {slice1d} from './slice1d';\nexport {slice2d} from './slice2d';\nexport {slice3d} from './slice3d';\nexport {slice4d} from './slice4d';\nexport {softmax} from './softmax';\nexport {softplus} from './softplus';\nexport {spaceToBatchND} from './space_to_batch_nd';\nexport {fft} from './spectral/fft';\nexport {ifft} from './spectral/ifft';\nexport {irfft} from './spectral/irfft';\nexport {rfft} from './spectral/rfft';\nexport {split} from './split';\nexport {sqrt} from './sqrt';\nexport {square} from './square';\nexport {squaredDifference} from './squared_difference';\nexport {squeeze} from './squeeze';\nexport {stack} from './stack';\nexport {step} from './step';\nexport {stridedSlice} from './strided_slice';\nexport {sub} from './sub';\nexport {sum} from './sum';\nexport {tan} from './tan';\nexport {tanh} from './tanh';\nexport {tensor} from './tensor';\nexport {tensor1d} from './tensor1d';\nexport {tensor2d} from './tensor2d';\nexport {tensor3d} from './tensor3d';\nexport {tensor4d} from

```

./tensor4d';\nextport {tensor5d} from './tensor5d';\nextport {tensor6d} from './tensor6d';\nextport {tile} from
./tile';\nextport {topk} from './topk';\nextport {truncatedNormal} from './truncated_normal';\nextport {unique} from
./unique';\nextport {unsortedSegmentSum} from './unsorted_segment_sum';\nextport {unstack} from
./unstack';\nextport {variable} from './variable';\nextport {where} from './where';\nextport {whereAsync} from
./where_async';\nextport {zeros} from './zeros';\nextport {zerosLike} from './zeros_like';\n\nnextport * from
./boolean_mask';\nextport * from './transpose';\nextport * from './norm';\nextport * from './moving_average';\nextport *
from './scatter_nd';\nextport * from './sparse_to_dense';\nextport * from './gather_nd';\nextport * from
./dropout';\nextport * from './signal_ops_util';\nextport * from './in_top_k';\n\nnextport {op, OP_SCOPE_SUFFIX}
from './operation';\n\nimport {rfft} from './spectral/rfft';\nimport {fft} from './spectral/fft';\nimport {ifft} from
./spectral/ifft';\nimport {irfft} from './spectral/irfft';\nconst spectral = {\n fft,\n ifft,\n rfft,\n irfft\n};\n\nimport * as
fused from './fused_ops';\n\nimport {hammingWindow} from './signal/hamming_window';\nimport {hannWindow}
from './signal/hann_window';\nimport {frame} from './signal/frame';\nimport {stft} from './signal/stft';\nconst signal
= {\n hammingWindow,\n hannWindow,\n frame,\n stft,\n};\n\n// Image Ops namespace\nimport
{cropAndResize} from './image/crop_and_resize';\nimport {flipLeftRight} from './image/flip_left_right';\nimport
{rotateWithOffset} from './image/rotate_with_offset';\nimport {nonMaxSuppression} from
./image/non_max_suppression';\nimport {nonMaxSuppressionAsync} from
./image/non_max_suppression_async';\nimport {nonMaxSuppressionWithScore} from
./image/non_max_suppression_with_score';\nimport {nonMaxSuppressionWithScoreAsync} from
./image/non_max_suppression_with_score_async';\nimport {nonMaxSuppressionPadded} from
./image/non_max_suppression_padded';\nimport {nonMaxSuppressionPaddedAsync} from
./image/non_max_suppression_padded_async';\nimport {resizeBilinear} from './image/resize_bilinear';\nimport
{resizeNearestNeighbor} from './image/resize_nearest_neighbor';\nconst image = {\n flipLeftRight,\n
resizeNearestNeighbor,\n resizeBilinear,\n rotateWithOffset,\n cropAndResize,\n nonMaxSuppression,\n
nonMaxSuppressionAsync,\n nonMaxSuppressionWithScore,\n nonMaxSuppressionWithScoreAsync,\n
nonMaxSuppressionPadded,\n nonMaxSuppressionPaddedAsync\n};\n\n// linalg namespace\nimport {bandPart}
from './linalg/band_part';\nimport {gramSchmidt} from './linalg/gram_schmidt';\nimport {qr} from
./linalg/qr';\nconst linalg = {\n bandPart,\n gramSchmidt,\n qr\n};\n\n// losses namespace;\nimport
{absoluteDifference} from './losses/absolute_difference';\nimport {computeWeightedLoss} from
./losses/compute_weighted_loss';\nimport {cosineDistance} from './losses/cosine_distance';\nimport {hingeLoss}
from './losses/hinge_loss';\nimport {huberLoss} from './losses/huber_loss';\nimport {logLoss} from
./losses/log_loss';\nimport {meanSquaredError} from './losses/mean_squared_error';\nimport
{sigmoidCrossEntropy} from './losses/sigmoid_cross_entropy';\nimport {softmaxCrossEntropy} from
./losses/softmax_cross_entropy';\nconst losses = {\n absoluteDifference,\n computeWeightedLoss,\n
cosineDistance,\n hingeLoss,\n huberLoss,\n logLoss,\n meanSquaredError,\n sigmoidCrossEntropy,\n
softmaxCrossEntropy\n};\n\n// Second level exports.\nextport {image, linalg, losses, spectral, fused,
signal};\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {dispose} from './globals';\nimport {variableGrads} from './gradients';\nimport {scalar} from
./ops/ops';\nimport {Serializable} from './serialization';\nimport {Scalar, Variable} from './tensor';\nimport
{NamedTensor, NamedTensorMap} from './tensor_types';\n\n/**\n * A variable that belongs to an optimizer.\n *\n * The `originalName` field is required for keeping track of the canonical\n * name of the variable, which is usually
the name of the model weight that\n * the variable is related to plus a suffix, e.g., 'dense1/kernel/momentum'.\n *
The name of the `Variable` object itself cannot be used directly due to\n * possible deduplication: Every `Variable`

```



```

must have a unique name but more than one optimizer objects of the same type may be created for the same
model or the same `Variable`.

export interface OptimizerVariable {
  originalName: string;
  variable: Variable;
}

/** @doc {heading: 'Training', subheading: 'Classes', namespace: 'train'} */
export abstract class Optimizer extends Serializable {
  protected iterations_: number;

  /** Executes `f()` and minimizes the scalar output of `f()` by computing
   * gradients of y with respect to the list of trainable variables provided by
   * `varList`. If no list is provided, it defaults to all trainable variables.
   * @param f The function to execute and whose output to minimize.
   * @param returnCost Whether to return the scalar cost value produced by
   * executing `f()`.
   * @param varList An optional list of variables to update. If specified, only
   * the trainable variables in varList will be updated by minimize. Defaults to
   * all trainable variables.
   */
  @doc {heading: 'Training', subheading: 'Optimizers'}
  minimize(f: () => Scalar, returnCost = false, varList?: Variable[]):
  Scalar | null {
    const {value, grads} = this.computeGradients(f, varList);
    if (varList != null) {
      const gradArray: NamedTensor[] = varList.map(v => ({name: v.name, tensor: grads[v.name]}));
      this.applyGradients(gradArray);
    } else {
      this.applyGradients(grads);
    }
    // Dispose gradients.
    dispose(grads);
    if (returnCost) {
      return value;
    } else {
      value.dispose();
      return null;
    }
  }

  /** The number of iterations that this optimizer instance has been invoked for.
   */
  get iterations(): number {
    if (this.iterations_ == null) {
      this.iterations_ = 0;
    }
    return this.iterations_;
  }

  protected incrementIterations() {
    this.iterations_ = this.iterations + 1;
  }

  /** Executes f() and computes the gradient of the scalar output of f() with
   * respect to the list of trainable variables provided by
   * `varList`. If no list is provided, it defaults to all trainable variables.
   * @param f The function to execute and whose output to use for computing
   * gradients with respect to variables.
   * @param varList An optional list of variables to compute gradients with
   * respect to. If specified, only the trainable variables in varList will
   * have gradients computed with respect to. Defaults to all trainable variables.
   */
  @doc {heading: 'Training', subheading: 'Optimizers'}
  computeGradients(f: () => Scalar, varList?: Variable[]):
  {value: Scalar, grads: NamedTensorMap} {
    return variableGrads(f, varList);
  }

  /** Updates variables by using the computed gradients.
   * @param variableGradients A mapping of variable name to its gradient
   * value.
   */
  @doc {heading: 'Training', subheading: 'Optimizers'}
  abstract applyGradients(variableGradients: NamedTensorMap) void;

  /** Dispose the variables (if any) owned by this optimizer instance.
   */
  dispose(): void {
    if (this.iterations_ != null) {
      dispose(this.iterations_);
    }
  }

  async saveIterations(): Promise<NamedTensor> {
    if (this.iterations_ == null) {
      this.iterations_ = 0;
    }
    return {
      name: 'iter', // Named for Python compatibility.
      // TODO(cais): Use 'int64' type when available.
      tensor: scalar(this.iterations_, 'int32')
    };
  }

  async getWeights(): Promise<NamedTensor[]> {
    throw new Error('getWeights() is not implemented for this optimizer yet.');
```

```

*/\n\nimport {ENGINE} from './engine';\nimport {dispose, tidy} from './globals';\nimport {add} from
 './ops/add';\nimport {div} from './ops/div';\nimport {mul} from './ops/mul';\nimport {sqrt} from
 './ops/ops';\nimport {square} from './ops/square';\nimport {zerosLike} from './ops/zeros_like';\nimport
 {ConfigDict, registerClass, Serializable, SerializableConstructor} from './serialization';\nimport {NamedTensor,
 NamedVariableMap} from './tensor_types';\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\n/**
 @doclink Optimizer */\nexport class AdadeltaOptimizer extends Optimizer {\n /** @nocollapse */\n static
 className = 'Adadelta'; // Name matters for Python compatibility.\n private accumulatedGrads:
 OptimizerVariable[] = [];\n private accumulatedUpdates: OptimizerVariable[] = [];\n\n constructor(\n
 protected learningRate: number, protected rho: number,\n protected epsilon: number = null) {\n super();\n\n
 if (epsilon == null) {\n this.epsilon = ENGINE.backend.epsilon();\n }\n }\n\n applyGradients(variableGradients:
 NamedVariableMap|NamedTensor[]) {\n const variableNames = Array.isArray(variableGradients) ?\n
 variableGradients.map(item => item.name) :\n Object.keys(variableGradients);\n\n
 variableNames.forEach((name, i) => {\n const value = ENGINE.registeredVariables[name];\n const trainable
 = false;\n if (this.accumulatedGrads[i] == null) {\n this.accumulatedGrads[i] = {\n originalName:
 `${name}/accum_grad`,\n variable: tidy(() => zerosLike(value).variable(trainable))\n }; \n } \n if
 (this.accumulatedUpdates[i] == null) {\n this.accumulatedUpdates[i] = {\n originalName:
 `${name}/accum_var`,\n variable: tidy(() => zerosLike(value).variable(trainable))\n }; \n } \n } \n } \n const
 gradient = Array.isArray(variableGradients) ?\n variableGradients[i].tensor :\n
 variableGradients[name];\n if (gradient == null) {\n return;\n } \n } \n } \n const accumulatedGrad =
 this.accumulatedGrads[i].variable;\n const accumulatedUpdate = this.accumulatedUpdates[i].variable;\n\n
 tidy(() => {\n const newAccumulatedGrad =\n add(mul(accumulatedGrad, this.rho),\n
 mul(square(gradient), 1 - this.rho));\n\n const updates =\n mul(div(sqrt(add(accumulatedUpdate,
 this.epsilon)),\n sqrt(add(accumulatedGrad, this.epsilon))),\n gradient);\n\n const
 newAccumulatedUpdate =\n add(mul(accumulatedUpdate, this.rho),\n mul(square(updates), 1 -
 this.rho));\n\n accumulatedGrad.assign(newAccumulatedGrad);\n
 accumulatedUpdate.assign(newAccumulatedUpdate);\n\n const newValue = add(mul(updates, -
 this.learningRate), value);\n value.assign(newValue);\n }); \n }); \n this.incrementIterations();\n } \n } \n\n
 dispose(): void {\n if (this.accumulatedUpdates != null) {\n dispose(this.accumulatedGrads.map(v =>
 v.variable));\n dispose(this.accumulatedUpdates.map(v => v.variable));\n } \n } \n } \n\n async getWeights():
 Promise<NamedTensor[]> {\n // Order matters for Python compatibility.\n const variables: OptimizerVariable[]
 =\n [...this.accumulatedGrads, ...this.accumulatedUpdates];\n return [await this.saveIterations()].concat(\n
 variables.map(v => ({name: v.originalName, tensor: v.variable}));\n } \n } \n\n async setWeights(weightValues:
 NamedTensor[]): Promise<void> {\n weightValues = await this.extractIterations(weightValues);\n const
 variableCount = weightValues.length / 2;\n const trainable = false;\n this.accumulatedGrads =\n
 weightValues.slice(0, variableCount).map(v => ({\n originalName: v.name,\n
 variable: v.tensor.variable(\n trainable)\n }));\n this.accumulatedUpdates =\n
 weightValues.slice(variableCount, variableCount * 2)\n .map(v => ({\n originalName: v.name,\n
 variable: v.tensor.variable(trainable)\n }));\n } \n } \n\n getConfig(): ConfigDict {\n return {\n
 'learningRate': this.learningRate,\n 'rho': this.rho,\n 'epsilon': this.epsilon\n }; \n } \n } \n\n /** @nocollapse */\n static fromConfig<T extends Serializable>(\n cls:
 SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(config['learningRate'], config['rho'],
 config['epsilon']);\n } \n } \n\nregisterClass(AdadeltaOptimizer);\n\n"/**\n * @license\n * Copyright 2018 Google
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
 http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from
 '../ops/add';\nimport {div} from '../ops/div';\nimport {fill} from '../ops/fill';\nimport {mul} from '../ops/mul';\nimport
 {sqrt} from '../ops/sqrt';\nimport {square} from '../ops/square';\nimport {ConfigDict, registerClass, Serializable,
 SerializableConstructor} from '../serialization';\nimport {NamedTensor, NamedVariableMap} from
 '../tensor_types';\n\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\n/** @doctest Optimizer
 */\n\nexport class AdagradOptimizer extends Optimizer {\n  /** @nocollapse */\n  static className = 'Adagrad'; //
Note: Name matters for Python compatibility.\n\n  private accumulatedGrads: OptimizerVariable[] = [];\n\n  constructor(\n
    protected learningRate: number, private initialAccumulatorValue = 0.1) {\n    super();\n  }\n\n  applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n    const variableNames =
    Array.isArray(variableGradients) ?\n      variableGradients.map(item => item.name) : \n
    Object.keys(variableGradients);\n\n    variableNames.forEach((name, i) => {\n      const value =
    ENGINE.registeredVariables[name];\n      if (this.accumulatedGrads[i] == null) {\n        const trainable = false;\n
        this.accumulatedGrads[i] = {\n          originalName: `${name}/accumulator`,\n          variable: tidy(\n
            () =>
            fill(value.shape, this.initialAccumulatorValue)\n              .variable(trainable))\n          );\n        }\n        const
        gradient = Array.isArray(variableGradients) ?\n          variableGradients[i].tensor : \n
        variableGradients[name];\n        if (gradient == null) {\n          return;\n        }\n        const accumulatedGrad =
        this.accumulatedGrads[i].variable;\n        tidy(() => {\n          const newAccumulatedGrad = add(accumulatedGrad,
        square(gradient));\n          accumulatedGrad.assign(newAccumulatedGrad);\n          const newValue = add(\n
        mul(div(gradient,\n              sqrt(add(newAccumulatedGrad, ENGINE.backend.epsilon()))),\n
        this.learningRate),\n          value);\n          value.assign(newValue);\n        });\n      });\n      this.incrementIterations();\n
    })\n\n    dispose(): void {\n      if (this.accumulatedGrads != null) {\n        dispose(this.accumulatedGrads.map(v =>
        v.variable));\n      }\n    }\n\n    async getWeights(): Promise<NamedTensor[]> {\n      // Order matters for Python
        compatibility.\n      return [await this.saveIterations()].concat(this.accumulatedGrads.map(\n        v => ({name:
        v.originalName, tensor: v.variable}));\n    }\n\n    async setWeights(weightValues: NamedTensor[]): Promise<void>
        {\n      weightValues = await this.extractIterations(weightValues);\n      const trainable = false;\n
        this.accumulatedGrads = weightValues.map(\n        v => ({originalName: v.name, variable:
        v.tensor.variable(trainable)}));\n    }\n\n    getConfig(): ConfigDict {\n      return {\n        'learningRate':
        this.learningRate,\n        'initialAccumulatorValue': this.initialAccumulatorValue,\n      }; \n    }\n\n    /** @nocollapse
        */\n\n    static fromConfig<T extends Serializable>(\n      cls: SerializableConstructor<T>, config: ConfigDict): T {\n
        return new cls(config['learningRate'], config['initialAccumulatorValue']);\n      }\n    }\n\n    registerClass(AdagradOptimizer);\n  },\n  /**\n   * @license\n   * Copyright 2018 Google LLC. All Rights
        Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you may not use this file
        except in compliance with the License.\n   * You may obtain a copy of the License at\n   * \n
        http://www.apache.org/licenses/LICENSE-2.0\n   * \n   * Unless required by applicable law or agreed to in writing,
        software\n   * distributed under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES
        OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language
        governing permissions and\n   * limitations under the License.\n   * \n
        =====
*\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from
 '../ops/add';\nimport {div} from '../ops/div';\nimport {mul} from '../ops/mul';\nimport {pow} from
 '../ops/pow';\nimport {scalar} from '../ops/scalar';\nimport {sqrt} from '../ops/sqrt';\nimport {square} from
 '../ops/square';\nimport {sub} from '../ops/sub';\nimport {zerosLike} from '../ops/zeros_like';\nimport {ConfigDict,
        registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {Variable} from
        '../tensor';\nimport {NamedTensor, NamedVariableMap} from '../tensor_types';\nimport {Optimizer,
        OptimizerVariable} from './optimizer';\n\nexport class AdamOptimizer extends Optimizer {\n  /** @nocollapse */\n
        static className = 'Adam'; // Note: Name matters for Python compatibility.\n  private accBeta1: Variable;\n
        private accBeta2: Variable;\n\n  private accumulatedFirstMoment: OptimizerVariable[] = [];\n  private
  
```

```

accumulatedSecondMoment: OptimizerVariable[] = [];
constructor(\n    protected learningRate: number,
protected beta1: number,\n    protected beta2: number, protected epsilon: number = null) {\n    super();\n    tidy(()
=> {\n    // accB* will be updated by batch.\n    this.accBeta1 = scalar(beta1).variable();\n    this.accBeta2 =
scalar(beta2).variable();\n    });\n\n    if (epsilon == null) {\n    this.epsilon = ENGINE.backend.epsilon();\n    }\n
}\n\n    applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n    const varNames =
Array.isArray(variableGradients) ?\n    variableGradients.map(v => v.name) :\n    Object.keys(variableGradients);\n    tidy(() => {\n    const oneMinusAccBeta1 = sub(1, this.accBeta1);\n    const
oneMinusAccBeta2 = sub(1, this.accBeta2);\n\n    varNames.forEach((name, i) => {\n    const value =
ENGINE.registeredVariables[name];\n    const trainable = false;\n    if (this.accumulatedFirstMoment[i] ==
null) {\n    this.accumulatedFirstMoment[i] = {\n    originalName: `${name}/m`,\n    variable: tidy(()
=> zerosLike(value).variable(trainable))\n    };\n    }\n    if (this.accumulatedSecondMoment[i] == null) {\n
this.accumulatedSecondMoment[i] = {\n    originalName: `${name}/v`,\n    variable: tidy(() =>
zerosLike(value).variable(trainable))\n    };\n    }\n\n    const gradient = Array.isArray(variableGradients)
?\n    variableGradients[i].tensor :\n    variableGradients[name];\n    if (gradient == null) {\n
return;\n    }\n\n    const firstMoment = this.accumulatedFirstMoment[i].variable;\n    const secondMoment =
this.accumulatedSecondMoment[i].variable;\n\n    const newFirstMoment =\n    add(mul(firstMoment,
this.beta1), mul(gradient, 1 - this.beta1));\n    const newSecondMoment =\n    add(mul(secondMoment,
this.beta2),\n    mul(square(gradient), 1 - this.beta2));\n\n    const biasCorrectedFirstMoment =
div(newFirstMoment, oneMinusAccBeta1);\n    const biasCorrectedSecondMoment =\n    div(newSecondMoment, oneMinusAccBeta2);\n\n    firstMoment.assign(newFirstMoment);\n
secondMoment.assign(newSecondMoment);\n\n    const newValue =\n    add(mul(div(biasCorrectedFirstMoment,\n    add(sqrt(biasCorrectedSecondMoment), this.epsilon)),\n    -this.learningRate),\n    value);\n    value.assign(newValue);\n    });\n\n
this.accBeta1.assign(mul(this.accBeta1, this.beta1));\n    this.accBeta2.assign(mul(this.accBeta2, this.beta2));\n
});\n    this.incrementIterations();\n    }\n\n    dispose(): void {\n    this.accBeta1.dispose();\n
this.accBeta2.dispose();\n    if (this.accumulatedFirstMoment != null) {\n
dispose(this.accumulatedFirstMoment.map(v => v.variable));\n    }\n    if (this.accumulatedSecondMoment != null)
{\n    dispose(this.accumulatedSecondMoment.map(v => v.variable));\n    }\n    }\n\n    async getWeights():
Promise<NamedTensor[]> {\n    // Order matters for Python compatibility.\n    const variables: OptimizerVariable[]
=\n    [...this.accumulatedFirstMoment, ...this.accumulatedSecondMoment];\n    return [await
this.saveIterations()].concat(\n    variables.map(v => ({name: v.originalName, tensor: v.variable}));\n    }\n\n
async setWeights(weightValues: NamedTensor[]): Promise<void> {\n    weightValues = await
this.extractIterations(weightValues);\n    tidy(() => {\n    this.accBeta1.assign(pow(this.beta1, this.iterations_ +
1));\n    this.accBeta2.assign(pow(this.beta2, this.iterations_ + 1));\n    });\n\n    const variableCount =
weightValues.length / 2;\n    const trainable = false;\n    this.accumulatedFirstMoment =\n    weightValues.slice(0,
variableCount).map(v => ({\n    originalName: v.name,\n
variable: v.tensor.variable(\n    trainable)\n    }));\n
this.accumulatedSecondMoment =\n    weightValues.slice(variableCount, variableCount * 2)\n    .map(v =>
({\n    originalName: v.name,\n    variable: v.tensor.variable(trainable)\n    }));\n    }\n\n
getConfig(): ConfigDict {\n    return {\n    'learningRate': this.learningRate,\n    'beta1': this.beta1,\n    'beta2':
this.beta2,\n    'epsilon': this.epsilon,\n    };\n    }\n\n    /** @nocollapse */\n    static fromConfig<T extends
Serializable>(\n    cls: SerializableConstructor<T>, config: ConfigDict): T {\n    return new cls(\n
config['learningRate'], config['beta1'], config['beta2'],\n    config['epsilon']);\n
}\n\n    registerClass(AdamOptimizer);\n    },"/*\n    * @license\n    * Copyright 2018 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the "License");\n    * you may not use this file except in
compliance with the License.\n    * You may obtain a copy of the License at\n    *\n    *
http://www.apache.org/licenses/LICENSE-2.0\n    *\n    * Unless required by applicable law or agreed to in writing,
software\n    * distributed under the License is distributed on an "AS IS" BASIS,\n    * WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====
*/
import {ENGINE} from './engine';
import {dispose, tidy} from './globals';
import {abs} from './ops/abs';
import {add} from './ops/add';
import {div} from './ops/div';
import {maximum} from './ops/maximum';
import {mul} from './ops/mul';
import {scalar} from './ops/scalar';
import {sub} from './ops/sub';
import {zerosLike} from './ops/zeros_like';
import {ConfigDict, registerClass, Serializable,
SerializableConstructor} from './serialization';
import {Variable} from './tensor';
import {NamedTensor,
NamedVariableMap} from './tensor_types';
import {Optimizer, OptimizerVariable} from './optimizer';
export
class AdamaxOptimizer extends Optimizer {
  /** @nocollapse */
  static className = 'Adamax'; // Note: Name
  matters for Python compatibility.
  private accBeta1: Variable;
  private iteration: Variable;
  private
  accumulatedFirstMoment: OptimizerVariable[] = [];
  private accumulatedWeightedInfNorm: OptimizerVariable[]
  = [];

  constructor(
    protected learningRate: number, protected beta1: number,
    protected beta2: number,
    protected epsilon: number = null,
    protected decay = 0.0) {
    super();
    tidy(() => {
      this.iteration =
      scalar(0).variable();
      this.accBeta1 = scalar(beta1).variable();
    });
    if (epsilon == null) {
      this.epsilon = ENGINE.backend.epsilon();
    }
    applyGradients(variableGradients:
    NamedVariableMap|NamedTensor[]) {
      const variableNames = Array.isArray(variableGradients) ?
      variableGradients.map(item => item.name) :
      Object.keys(variableGradients);
      tidy(() => {
        const
        oneMinusAccBeta1 = sub(1, this.accBeta1);
        const lr =
        div(-this.learningRate, add(mul(this.iteration,
        this.decay), 1));
        variableNames.forEach((name, i) => {
          const value =
          ENGINE.registeredVariables[name];
          const trainable = false;
          if (this.accumulatedFirstMoment[i] ==
          null) {
            this.accumulatedFirstMoment[i] = {
              originalName: `${name}/m`,
              variable:
              zerosLike(value).variable(trainable)
            };
            if (this.accumulatedWeightedInfNorm[i] == null) {
              this.accumulatedWeightedInfNorm[i] = {
                originalName: `${name}/v`,
                variable:
                zerosLike(value).variable(trainable)
            };
            const gradient = Array.isArray(variableGradients) ?
            variableGradients[i].tensor :
            variableGradients[name];
            if (gradient == null) {
              return;
            }
            const firstMoment = this.accumulatedFirstMoment[i].variable;
            const weightedInfNorm =
            this.accumulatedWeightedInfNorm[i].variable;
            const newFirstMoment =
            add(mul(firstMoment,
            this.beta1), mul(gradient, 1 - this.beta1));
            const ut0 = mul(weightedInfNorm, this.beta2);
            const ut1 =
            abs(gradient);
            const newWeightedInfNorm = maximum(ut0, ut1);
            firstMoment.assign(newFirstMoment);
            weightedInfNorm.assign(newWeightedInfNorm);
            const
            newValue =
            add(mul(div(lr, oneMinusAccBeta1),
            div(newFirstMoment,
            add(newWeightedInfNorm, this.epsilon))),
            value);
            value.assign(newValue);
          });
          this.iteration.assign(add(this.iteration, 1));
          this.accBeta1.assign(mul(this.accBeta1, this.beta1));
        });
        this.incrementIterations();
      });
      dispose(): void {
        this.accBeta1.dispose();
        this.iteration.dispose();
        if (this.accumulatedFirstMoment != null) {
          dispose(this.accumulatedFirstMoment.map(v => v.variable));
        }
        if (this.accumulatedWeightedInfNorm != null) {
          dispose(this.accumulatedWeightedInfNorm.map(v =>
          v.variable));
        }
      }
      async getWeights(): Promise<NamedTensor[]> {
        throw new Error('getWeights() is
        not implemented for Adamax yet.');
```

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```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {keep, tidy} from './globals';\nimport {add} from './ops/add';\nimport {mul} from './ops/mul';\nimport {scalar} from './ops/scalar';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from './serialization';\nimport {Scalar} from './tensor';\nimport {NamedTensor, NamedTensorMap} from './tensor_types';\n\nimport {Optimizer} from './optimizer';\n\n/**\n * @doclink Optimizer *\n */\nexport class SGDOptimizer extends Optimizer {\n  /** @nocollapse */\n  static className = 'SGD'; // Note: Name matters for Python compatibility.\n  protected c: Scalar;\n  constructor(protected learningRate: number) {\n    super();\n    this.setLearningRate(learningRate);\n  }\n  applyGradients(variableGradients: NamedTensorMap|NamedTensor[]) {\n    const varNames = Array.isArray(variableGradients) ?\n      variableGradients.map(v => v.name) :\n      Object.keys(variableGradients);\n    varNames.forEach((name, i) => {\n      const gradient = Array.isArray(variableGradients) ?\n        variableGradients[i].tensor :\n        variableGradients[name];\n      if (gradient == null) {\n        return;\n      }\n      const value = ENGINE.registeredVariables[name];\n      tidy(() => {\n        const newValue = add(mul(this.c, gradient), value);\n        value.assign(newValue);\n      });\n      this.incrementIterations();\n    });\n  }\n  /**\n   * Sets the learning rate of the optimizer.\n   */\n  setLearningRate(learningRate: number) {\n    this.learningRate = learningRate;\n    if (this.c != null) {\n      this.c.dispose();\n    }\n    this.c = keep(scalar(-learningRate));\n  }\n  dispose() {\n    this.c.dispose();\n  }\n  async getWeights(): Promise<NamedTensor[]> {\n    return [await this.saveIterations()];\n  }\n  async setWeights(weightValues: NamedTensor[]): Promise<void> {\n    weightValues = await this.extractIterations(weightValues);\n    if (weightValues.length !== 0) {\n      throw new Error('SGD optimizer does not have settable weights.);\n    }\n  }\n  getConfig(): ConfigDict {\n    return {'learningRate': this.learningRate};\n  }\n  /** @nocollapse */\n  static fromConfig<T extends Serializable>(cls: SerializableConstructor<T>, config: ConfigDict): T {\n    return new cls(config['learningRate']);\n  }\n}\n\nregisterClass(SGDOptimizer);\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {dispose, tidy} from './globals';\nimport {add} from './ops/add';\nimport {mul} from './ops/mul';\nimport {scalar} from './ops/scalar';\nimport {zerosLike} from './ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from './serialization';\nimport {Scalar, Tensor} from './tensor';\nimport {NamedTensor, NamedVariableMap} from './tensor_types';\n\nimport {OptimizerVariable} from './optimizer';\nimport {SGDOptimizer} from './sgd_optimizer';\n\n/**\n * @doclink Optimizer *\n */\nexport class MomentumOptimizer extends SGDOptimizer {\n  /** @nocollapse */\n  static className = 'Momentum'; // Name matters for Python compatibility.\n  private m: Scalar;\n  private accumulations: OptimizerVariable[] = [];\n  constructor(\n    protected learningRate: number,\n    private momentum: number,\n    private useNesterov = false) {\n    super(learningRate);\n    this.m = scalar(this.momentum);\n  }\n  applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n    const variableNames = Array.isArray(variableGradients) ?\n      variableGradients.map(item => item.name) :\n      Object.keys(variableGradients);\n    variableNames.forEach((name, i) => {\n      const value = ENGINE.registeredVariables[name];\n      if (this.accumulations[i] == null) {\n        const trainable = false;\n        this.accumulations[i] = {\n          originalName: `_${name}/momentum`,\n          variable: tidy(() =>\n
```

```

zerosLike(value).variable(trainable))\n    );\n    }\n\n    const accumulation = this.accumulations[i].variable;\n    const gradient = Array.isArray(variableGradients) ?\n      variableGradients[i].tensor :\n      variableGradients[name];\n    if (gradient == null) {\n      return;\n    }\n\n    tidy(() => {\n      let newValue:\n      Tensor;\n      const newAccumulation = add(mul(this.m, accumulation), gradient);\n      if (this.useNesterov) {\n        newValue = add(\n          mul(this.c, add(gradient, mul(newAccumulation, this.m))), value);\n      } else {\n        newValue = add(mul(this.c, newAccumulation), value);\n      }\n      accumulation.assign(newAccumulation);\n      value.assign(newValue);\n    });\n  });\n  this.incrementIterations();\n}\n\ndispose(): void {\n  this.m.dispose();\n  if (this.accumulations != null) {\n    dispose(this.accumulations.map(v => v.variable));\n  }\n}\n\n/**\n * Sets the momentum of the optimizer.\n *\n * @param momentum\n */\nsetMomentum(momentum: number) {\n  this.momentum = momentum;\n}\n\nasync getWeights():\nPromise<NamedTensor[]> {\n  // Order matters for Python compatibility.\n  return [await\nthis.saveIterations()].concat(this.accumulations.map(\n    v => ({name: v.originalName, tensor: v.variable}));\n)\n\n  async setWeights(weightValues: NamedTensor[]): Promise<void> {\n    weightValues = await\nthis.extractIterations(weightValues);\n    const trainable = false;\n    this.accumulations = weightValues.map(\n    v => ({originalName: v.name, variable: v.tensor.variable(trainable)});\n  )\n\n  getConfig(): ConfigDict {\n    return\n    {\n      'learningRate': this.learningRate,\n      'momentum': this.momentum,\n      'useNesterov': this.useNesterov\n    };\n  }\n\n  /** @nocollapse */\n  static fromConfig<T extends Serializable>(\n    cls: SerializableConstructor<T>,\n    config: ConfigDict): T {\n    return new cls(\n      config['learningRate'], config['momentum'],\n      config['useNesterov']);\n  }\n}\n\nregisterClass(MomentumOptimizer);\n"/**\n * @license\n * Copyright 2018\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\n\nimport {ENGINE} from './engine';\nimport {dispose, tidy} from './globals';\nimport {add} from\n './ops/add';\nimport {div} from './ops/div';\nimport {mul} from './ops/mul';\nimport {sqrt} from\n './ops/sqrt';\nimport {square} from './ops/square';\nimport {sub} from './ops/sub';\nimport {zerosLike} from\n './ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from\n './serialization';\nimport {NamedTensor, NamedTensorMap} from './tensor_types';\nimport {Optimizer,\nOptimizerVariable} from './optimizer';\n\n/** @doclink Optimizer */\nexport class RMSPropOptimizer extends\nOptimizer {\n  /** @nocollapse */\n  static className = 'RMSProp'; // Note: Name matters for Python\n  compatibility.\n  private centered: boolean;\n\n  private accumulatedMeanSquares: OptimizerVariable[] = [];\n  private accumulatedMoments: OptimizerVariable[] = [];\n  private accumulatedMeanGrads: OptimizerVariable[] =\n  [];\n\n  constructor(\n    protected learningRate: number, protected decay = 0.9,\n    protected momentum = 0.0,\n    protected epsilon: number = null,\n    centered = false) {\n    super();\n\n    this.centered = centered;\n\n    if\n    (epsilon == null) {\n      this.epsilon = ENGINE.backend.epsilon();\n    }\n\n    if (learningRate == null) {\n      throw\n      new Error(`learningRate for RMSPropOptimizer must be defined.`);\n    }\n  }\n\n  applyGradients(variableGradients: NamedTensorMap|NamedTensor[]) {\n    const variableNames =\n    Array.isArray(variableGradients) ?\n      variableGradients.map(item => item.name) :\n      Object.keys(variableGradients);\n\n    variableNames.forEach((name, i) => {\n      const value =\n      ENGINE.registeredVariables[name];\n      const trainable = false;\n      if (this.accumulatedMeanSquares[i] == null)\n      {\n        this.accumulatedMeanSquares[i] = {\n          originalName: `${name}/rms`,\n          variable: tidy(() =>\nzerosLike(value).variable(trainable))\n        );\n      }\n      if (this.accumulatedMoments[i] == null) {\n        this.accumulatedMoments[i] = {\n          originalName: `${name}/momentum`,\n          variable: tidy(() =>\nzerosLike(value).variable(trainable))\n        );\n      }\n      if (this.accumulatedMeanGrads[i] == null &&\nthis.centered) {\n        this.accumulatedMeanGrads[i] = {\n          originalName: `${name}/mg`,\n          variable:

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tidy() => zerosLike(value).variable(trainable))\n    };\n    }\n\n    const gradient =
Array.isArray(variableGradients) ?\n    variableGradients[i].tensor :\n    variableGradients[name];\n    if
(gradient == null) {\n    return;\n    }\n\n    const accumulatedMeanSquare =
this.accumulatedMeanSquares[i].variable;\n    const accumulatedMoments =
this.accumulatedMoments[i].variable;\n    tidy() => {\n    const newAccumulatedMeanSquare =\n    add(mul(accumulatedMeanSquare, this.decay),\n    mul(square(gradient), 1 - this.decay));\n    if
(this.centered) {\n    const accumulatedMeanGrad = this.accumulatedMeanGrads[i].variable;\n    // Centered
gradient\n    const newAccumulatedMeanGrad =\n    add(mul(accumulatedMeanGrad, this.decay),\n    mul(gradient, 1 - this.decay));\n    const gradContribution =\n    div(mul(gradient,
this.learningRate),\n    sqrt(\n    sub(newAccumulatedMeanSquare,\n    add(square(newAccumulatedMeanGrad), this.epsilon)));\n    const newAccumulatedMoments =\n    add(mul(accumulatedMoments, this.momentum), gradContribution);\n    accumulatedMeanSquare.assign(newAccumulatedMeanSquare);\n    accumulatedMeanGrad.assign(newAccumulatedMeanGrad);\n    accumulatedMoments.assign(newAccumulatedMoments);\n    const newValue = sub(value,
newAccumulatedMoments);\n    value.assign(newValue);\n    } else {\n    // Plain gradient\n    const
newAccumulatedMeanSquare =\n    add(mul(accumulatedMeanSquare, this.decay),\n    mul(square(gradient), 1 - this.decay));\n    const newAccumulatedMoments =\n    add(mul(accumulatedMoments, this.momentum),\n    div(mul(gradient, this.learningRate),\n    sqrt(add(newAccumulatedMeanSquare, this.epsilon)));\n    accumulatedMeanSquare.assign(newAccumulatedMeanSquare);\n    accumulatedMoments.assign(newAccumulatedMoments);\n    const newValue = sub(value,
newAccumulatedMoments);\n    value.assign(newValue);\n    }\n    });\n    });\n    this.incrementIterations();\n    }\n\n    dispose(): void {\n    if (this.accumulatedMeanSquares != null) {\n    dispose(this.accumulatedMeanSquares.map(v => v.variable));\n    }\n    if (this.accumulatedMeanGrads != null &&
this.centered) {\n    dispose(this.accumulatedMeanGrads.map(v => v.variable));\n    }\n    if
(this.accumulatedMoments != null) {\n    dispose(this.accumulatedMoments.map(v => v.variable));\n    }\n    }\n\n    async getWeights(): Promise<NamedTensor[]> {\n    // Order matters for Python compatibility.\n    const variables:
OptimizerVariable[] =\n    [...this.accumulatedMeanSquares, ...this.accumulatedMoments];\n    if (this.centered)
{\n    variables.push(...this.accumulatedMeanGrads);\n    }\n    return [await this.saveIterations()].concat(\n    variables.map(v => ({name: v.originalName, tensor: v.variable}));\n    }\n\n    async setWeights(weightValues:
NamedTensor[]): Promise<void> {\n    weightValues = await this.extractIterations(weightValues);\n    const
variableCount =\n    this.centered ? weightValues.length / 3 : weightValues.length / 2;\n    const trainable =
false;\n    this.accumulatedMeanSquares =\n    weightValues.slice(0, variableCount).map(v => ({\n    originalName: v.name,\n    variable: v.tensor.variable(\n    trainable)\n    }));\n    this.accumulatedMoments =\n    weightValues.slice(variableCount, variableCount * 2)\n    .map(v => ({\n    originalName: v.name,\n    variable: v.tensor.variable(trainable)\n    }));\n    if (this.centered) {\n    this.accumulatedMeanGrads =\n    weightValues.slice(variableCount * 2, variableCount * 3)\n    .map(v
=> ({\n    originalName: v.name,\n    variable: v.tensor.variable(trainable)\n    }));\n    }\n    }\n\n    getConfig(): ConfigDict {\n    return {\n    'learningRate': this.learningRate,\n    'decay': this.decay,\n    'momentum': this.momentum,\n    'epsilon': this.epsilon,\n    'centered': this.centered\n    };}\n\n    /**
@nocollapse */\n    static fromConfig<T extends Serializable>(\n    cls: SerializableConstructor<T>, config:
ConfigDict): T {\n    return new cls(\n    config['learningRate'], config['decay'], config['momentum'],\n    config['epsilon'], config['centered']);\n    }\n\n    registerClass(RMSPropOptimizer);\n    /**\n    * @license\n    * Copyright 2018 Google LLC. All Rights Reserved.\n    * Licensed under the Apache License, Version 2.0 (the
'License');\n    * you may not use this file except in compliance with the License.\n    * You may obtain a copy of the
License at\n    * http://www.apache.org/licenses/LICENSE-2.0\n    * Unless required by applicable law or

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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {AdadelatOptimizer} from './adadelat_optimizer';\nimport {AdagradOptimizer} from './adagrad_optimizer';\nimport {AdamOptimizer} from './adam_optimizer';\nimport {AdamaxOptimizer} from './adamax_optimizer';\nimport {MomentumOptimizer} from './momentum_optimizer';\nimport {RMSPropOptimizer} from './rmsprop_optimizer';\nimport {SGDOptimizer} from './sgd_optimizer';\n\nexport class OptimizerConstructors {\n  /**\n   * Constructs a `tf.SGDOptimizer` that uses stochastic gradient descent.\n   *\n   *  
js\n   * // Fit a quadratic function by learning the coefficients a, b, c.\n   * const xs = tf.tensor1d([0, 1, 2, 3]);\n   * const ys = tf.tensor1d([1.1, 5.9, 16.8, 33.9]);\n   * const a = tf.scalar(Math.random()).variable();\n   * const b = tf.scalar(Math.random()).variable();\n   * const c = tf.scalar(Math.random()).variable();\n   * const y = a * x^2 + b * x + c.\n   * const f = x => a.mul(x.square()).add(b.mul(x)).add(c);\n   * const loss = (pred, label) => pred.sub(label).square().mean();\n   * const learningRate = 0.01;\n   * const optimizer = tf.train.sgd(learningRate);\n   * // Train the model.\n   * for (let i = 0; i < 10; i++) {\n   *   optimizer.minimize(() => loss(f(xs), ys));\n   * }\n   * // Make predictions.\n   * console.log(`a: ${a.dataSync()}, b: ${b.dataSync()}, c: ${c.dataSync()}`);\n   * const preds = f(xs).dataSync();\n   * preds.forEach((pred, i) => {\n   *   console.log(`x: ${i}, pred: ${pred}`);\n   * });\n   *``\n   * @param learningRate The learning rate to use for the SGD algorithm.\n   * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n   *\n   * static sgd(learningRate: number): SGDOptimizer {\n   *   return new SGDOptimizer(learningRate);\n   * }\n   *\n   * Constructs a `tf.MomentumOptimizer` that uses momentum gradient\n   * descent.\n   * See\n   *  
[http://proceedings.mlr.press/v28/sutskever13.pdf](http://proceedings.mlr.press/v28/sutskever13.pdf)\n   *\n   * @param learningRate The learning rate to use for the Momentum gradient\n   * descent algorithm.\n   * @param momentum The momentum to use for the momentum gradient descent\n   * algorithm.\n   * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n   *\n   * static momentum(learningRate: number, momentum: number, useNesterov = false):\n   *   MomentumOptimizer {\n   *     return new MomentumOptimizer(learningRate, momentum, useNesterov);\n   *   }\n   *\n   * Constructs a `tf.RMSPropOptimizer` that uses RMSProp gradient\n   * descent. This implementation uses plain momentum and is not centered\n   * version of RMSProp.\n   * See\n   *  
[http://www.cs.toronto.edu/~tijmen/csc321/slides/lecture_slides_lec6.pdf](http://www.cs.toronto.edu/~tijmen/csc321/slides/lecture_slides_lec6.pdf)\n   *\n   * @param learningRate The learning rate to use for the RMSProp gradient\n   * descent algorithm.\n   * @param decay The discounting factor for the history/coming gradient.\n   * @param momentum The momentum to use for the RMSProp gradient descent\n   * algorithm.\n   * @param epsilon Small value to avoid zero denominator.\n   * @param centered If true, gradients are normalized by the estimated\n   * variance of the gradient.\n   * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n   *\n   * static rmsprop(learningRate: number, decay = .9, momentum = 0.0, epsilon: number = null,\n   *   centered = false): RMSPropOptimizer {\n   *     return new RMSPropOptimizer(learningRate, decay, momentum, epsilon, centered);\n   *   }\n   *\n   * Constructs a `tf.AdamOptimizer` that uses the Adam algorithm.\n   * See\n   *  
[https://arxiv.org/abs/1412.6980](https://arxiv.org/abs/1412.6980)\n   *\n   * @param learningRate The learning rate to use for the Adam gradient\n   * descent algorithm.\n   * @param beta1 The exponential decay rate for the 1st moment estimates.\n   * @param beta2 The exponential decay rate for the 2nd moment estimates.\n   * @param epsilon A small constant for numerical stability.\n   * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n   *\n   * static adam(learningRate = 0.001, beta1 = 0.9, beta2 = 0.999, epsilon: number = null):\n   *   AdamOptimizer {\n   *     return new AdamOptimizer(learningRate, beta1, beta2, epsilon);\n   *   }\n   *\n   * Constructs a `tf.AdadelatOptimizer` that uses the Adadelat algorithm.\n   * See\n   *  
[https://arxiv.org/abs/1212.5701](https://arxiv.org/abs/1212.5701)\n   *\n   * @param learningRate The learning rate to use for the Adadelat gradient\n   * descent algorithm.\n   * @param rho The learning rate decay over each
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update.\n * @param epsilon A constant epsilon used to better condition the grad\n * update.\n *\n * @doc
{heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n *\n static adadelta(learningRate = .001, rho =
.95, epsilon: number = null):\n   AdadeltaOptimizer {\n     return new AdadeltaOptimizer(learningRate, rho,
epsilon);\n   }\n\n /**\n * Constructs a `tf.AdamaxOptimizer` that uses the Adamax algorithm.\n * See
[https://arxiv.org/abs/1412.6980](https://arxiv.org/abs/1412.6980)\n *\n * @param learningRate The learning rate
to use for the Adamax gradient\n * descent algorithm.\n * @param beta1 The exponential decay rate for the 1st
moment estimates.\n * @param beta2 The exponential decay rate for the 2nd moment estimates.\n * @param
epsilon A small constant for numerical stability.\n * @param decay The learning rate decay over each update.\n
*\n * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n *\n static adamax(\n
learningRate = 0.002, beta1 = 0.9, beta2 = 0.999, epsilon: number = null,\n   decay = 0.0): AdamaxOptimizer {\n
return new AdamaxOptimizer(learningRate, beta1, beta2, epsilon, decay);\n   }\n\n /**\n * Constructs a
`tf.AdagradOptimizer` that uses the Adagrad algorithm.\n * See\n *
[http://www.jmlr.org/papers/volume12/duchi11a/duchi11a.pdf](\n *
http://www.jmlr.org/papers/volume12/duchi11a/duchi11a.pdf)\n * or\n * [http://ruder.io/optimizing-gradient-
descent/index.html#adagrad](\n * http://ruder.io/optimizing-gradient-descent/index.html#adagrad)\n *\n *
@param learningRate The learning rate to use for the Adagrad gradient\n * descent algorithm.\n * @param
initialAccumulatorValue Starting value for the accumulators, must be\n * positive.\n *\n * @doc {heading:
'Training', subheading: 'Optimizers', namespace: 'train'}\n *\n static adagrad(learningRate: number,
initialAccumulatorValue = 0.1):\n   AdagradOptimizer {\n     return new AdagradOptimizer(learningRate,
initialAccumulatorValue);\n   }\n\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\n// So typings can propagate.\nimport {AdadeltaOptimizer} from './optimizers/adadelta_optimizer';\nimport
{AdagradOptimizer} from './optimizers/adagrad_optimizer';\nimport {AdamOptimizer} from
 './optimizers/adam_optimizer';\nimport {AdamaxOptimizer} from './optimizers/adamax_optimizer';\nimport
{MomentumOptimizer} from './optimizers/momentum_optimizer';\nimport {OptimizerConstructors} from
 './optimizers/optimizer_constructors';\nimport {RMSPropOptimizer} from
 './optimizers/rmsprop_optimizer';\nimport {SGDOptimizer} from './optimizers/sgd_optimizer';\n\n// tslint:disable-
next-line:no-unused-expression\n[MomentumOptimizer, SGDOptimizer, AdadeltaOptimizer, AdagradOptimizer,\n
RMSPropOptimizer, AdamaxOptimizer, AdamOptimizer];\n\nexport const train = {\n  sgd:\n    OptimizerConstructors.sgd,\n  momentum: OptimizerConstructors.momentum,\n  adadelta:\n    OptimizerConstructors.adadelta,\n  adagrad: OptimizerConstructors.adagrad,\n  rmsprop:\n    OptimizerConstructors.rmsprop,\n  adamax: OptimizerConstructors.adamax,\n  adam:\n    OptimizerConstructors.adam\n};\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nconst delayCallback: Function = (() => {\n  if (typeof requestAnimationFrame !== 'undefined') {\n    return
requestAnimationFrame;\n  } else if (typeof setImmediate !== 'undefined') {\n    return setImmediate;\n  }\n  return

```


software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nexport const SELU_SCALEALPHA = 1.7580993408473768599402175208123;\nexport const SELU_SCALE = 1.0507009873554804934193349852946;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nexport const ERF_P = 0.3275911;\nexport const ERF_A1 = 0.254829592;\nexport const ERF_A2 = -0.284496736;\nexport const ERF_A3 = 1.421413741;\nexport const ERF_A4 = -1.453152027;\nexport const ERF_A5 = 1.061405429;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\nimport {env} from './environment';\nexport function warn(...msg: Array<{}>): void {\n  if (!env().getBool('IS_TEST')) {\n    console.warn(...msg);\n  }\n}\nexport function log(...msg: Array<{}>): void {\n  if (!env().getBool('IS_TEST')) {\n    console.log(...msg);\n  }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {TypedArray} from './types';\n/**\n * Merges real and imaginary Float32Arrays into a single complex Float32Array.\n * The memory layout is interleaved as follows:\n * real: [r0, r1, r2]\n * imag: [i0, i1, i2]\n * complex: [r0, i0, r1, i1, r2, i2]\n * This is the inverse of splitRealAndImagArrays.\n * @param real The real values of the complex tensor values.\n * @param imag The imag values of the complex tensor values.\n * @returns A complex tensor as a Float32Array with merged values.\n */\nexport function mergeRealAndImagArrays(\n  real: Float32Array, imag: Float32Array): Float32Array {\n  if (real.length !== imag.length) {\n    throw new Error(\n      `Cannot merge real and imag arrays of different lengths. real: ` +\n        `${real.length}, imag: ${imag.length}.`);\n  }\n  const result = new Float32Array(real.length * 2);\n  for (let i = 0; i < result.length; i += 2) {\n    result[i] = real[i / 2];\n    result[i + 1] = imag[i / 2];\n  }\n  return result;\n}\n/**\n * Splits a complex Float32Array into real and imag parts.\n * The memory layout is interleaved as follows:\n * complex: [r0, i0, r1, i1, r2, i2]\n * real: [r0, r1, r2]\n * imag: [i0, i1, i2]\n * This is the inverse of mergeRealAndImagArrays.\n * @param complex The complex tensor values.\n * @returns An object with real and imag Float32Array components of the complex\n * tensor.\n */\nexport function splitRealAndImagArrays(complex: Float32Array): {\n  real: Float32Array, imag: Float32Array\n} {\n  const real = new Float32Array(complex.length / 2);\n  const imag = new Float32Array(complex.length / 2);\n  for (let i = 0; i < complex.length; i += 2) {\n    real[i / 2] = complex[i];\n  }\n}
```

```
imag[i / 2] = complex[i + 1];\n }\n return {real, imag};\n}\n\n/**\n * Extracts even indexed complex values in the\n given array.\n * @param complex The complex tensor values\n */\nexport function\ncomplexWithEvenIndex(complex: Float32Array):\n {real: Float32Array, imag: Float32Array} {\n const len =\n Math.ceil(complex.length / 4);\n const real = new Float32Array(len);\n const imag = new Float32Array(len);\n for (let i = 0; i < complex.length; i += 4) {\n real[Math.floor(i / 4)] = complex[i];\n imag[Math.floor(i / 4)] =\n complex[i + 1];\n }\n return {real, imag};\n}\n\n/**\n * Extracts odd indexed comple values in the given array.\n * @param complex The complex tensor values\n */\nexport function\ncomplexWithOddIndex(complex:\n Float32Array):\n {real: Float32Array, imag: Float32Array} {\n const len = Math.floor(complex.length / 4);\n const real = new Float32Array(len);\n const imag = new Float32Array(len);\n for (let i = 2; i < complex.length; i\n += 4) {\n real[Math.floor(i / 4)] = complex[i];\n imag[Math.floor(i / 4)] = complex[i + 1];\n }\n return {real,\n imag};\n}\n\n/**\n * Get the map representing a complex value in the given array.\n * @param complex The\n complex tensor values.\n * @param index An index of the target complex value.\n */\nexport function\ngetComplexWithIndex(\n complex: Float32Array, index: number): {real: number, imag: number} {\n const real =\n complex[index * 2];\n const imag = complex[index * 2 + 1];\n return {real, imag};\n}\n\n/**\n * Insert a given\n complex value into the TypedArray.\n * @param data The array in which the complex value is inserted.\n * @param c The complex value to be inserted.\n * @param index An index of the target complex value.\n */\nexport\nfunction\nassignToTypedArray(\n data: TypedArray, real: number, imag: number, index: number) {\n data[index *\n 2] = real;\n data[index * 2 + 1] = imag;\n}\n\n/**\n * Make the list of exponent terms used by FFT.\n */\nexport\nfunction\nexponents(\n n: number, inverse: boolean): {real: Float32Array, imag: Float32Array} {\n const real =\n new Float32Array(n / 2);\n const imag = new Float32Array(n / 2);\n for (let i = 0; i < Math.ceil(n / 2); i++) {\n const x = (inverse ? 2 : -2) * Math.PI * (i / n);\n real[i] = Math.cos(x);\n imag[i] = Math.sin(x);\n }\n return\n {real, imag};\n}\n\n/**\n * Make the exponent term used by FFT.\n */\nexport\nfunction\nexponent(\n k: number, n:\n number, inverse: boolean): {real: number, imag: number} {\n const x = (inverse ? 2 : -2) * Math.PI * (k / n);\n const real = Math.cos(x);\n const imag = Math.sin(x);\n return {real, imag};\n}\n\n"/**\n * @license\n * Copyright\n 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n */\n *\n http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */\n\n=====\n\nimport {TensorInfo} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {assert} from\n './util';\n\n/**\n * Prepare the split size array. When the input is a number, the axis is evenly\n * divided among the\n split size. When the input contains the negative value, the\n * rest of the axis is allocated toward that.\n */\nexport\nfunction\nprepareSplitSize(\n x: Tensor|TensorInfo, numOrSizeSplits: number[]|number, \n axis = 0): number[]\n {\n let splitSizes = [];\n if (typeof (numOrSizeSplits) === 'number') {\n assert(\n x.shape[axis] %\n numOrSizeSplits === 0, \n () => 'Number of splits must evenly divide the axis.);\n splitSizes =\n new\n Array(numOrSizeSplits).fill(x.shape[axis] / numOrSizeSplits);\n } else {\n const numOfNegs =\n numOrSizeSplits.reduce((count, value) => {\n if (value === -1) {\n count += 1;\n }\n return count;\n }, 0);\n assert(\n numOfNegs <= 1, \n () => 'There should be only one negative value in split array.);\n const negIndex = numOrSizeSplits.indexOf(-1);\n // Allow the number of split array to be -1, which indicates the\n rest\n // of dimension is allocated to that split.\n if (negIndex !== -1) {\n const total =\n numOrSizeSplits.reduce((a, b) => b > 0 ? a + b : a);\n numOrSizeSplits[negIndex] = x.shape[axis] - total;\n }\n assert(\n x.shape[axis] === numOrSizeSplits.reduce((a, b) => a + b), \n () => 'The sum of sizes must match\n the size of the axis dimension.);\n splitSizes = numOrSizeSplits;\n }\n\n return splitSizes;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n */\n *\n http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
```

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* distributed under the License is distributed on an "AS IS" BASIS,
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* See the License for the specific language governing permissions and
* limitations under the License.

```
=====  
*  
import {TensorInfo} from './kernel_registry';  
import {nearestDivisor} from './util';  
import {PARALLELIZE_THRESHOLD} from './reduce_util';  
export interface SegOpInfo {  
  windowSize: number;  
  batchSize: number;  
  inSize: number;  
  numSegments: number;  
}  
export function  
segOpComputeOptimalWindowSize(  
  inSize: number, numSegments: number): number {  
  let done = false;  
  let res;  
  if (inSize <= PARALLELIZE_THRESHOLD) {  
    res = inSize;  
    done = true;  
  } else {  
    res = nearestDivisor(inSize, Math.floor(Math.sqrt(inSize)));  
  }  
  while (!done) {  
    if (res > numSegments || res ===  
inSize) {  
      done = true;  
    } else {  
      res = nearestDivisor(inSize, res + 1);  
    }  
  }  
  return  
res;  
}  
export function computeOutShape(  
  aShape: number[], axis: number, numSegments: number):  
number[] {  
  const outShape = [];  
  const rank = aShape.length;  
  for (let dim = 0; dim < rank; dim++) {  
    if (dim !== axis) {  
      outShape.push(aShape[dim]);  
    } else {  
      outShape.push(numSegments);  
    }  
  }  
  return outShape;  
}  
export interface GatherOpShapeInfo {  
  batchSize: number;  
  sliceSize: number;  
  outerSize: number;  
  dimSize: number;  
  outputShape: number[];  
}  
export function  
collectGatherOpShapeInfo(  
  x: TensorInfo, indices: TensorInfo, axis: number,  
  batchDims: number):  
GatherOpShapeInfo {  
  const indicesRank = indices.shape.length;  
  const xRank = x.shape.length;  
  if (batchDims !== 0) {  
    if (batchDims < -indicesRank || batchDims > indicesRank) {  
      throw new Error(`Expect  
batchDims in the range of [-${indicesRank}, ${  
indicesRank}], but got ${batchDims}`);  
    }  
    if (batchDims < 0) {  
      batchDims += indicesRank;  
    }  
    if (batchDims > xRank) {  
      throw new  
Error(`batchDims (${batchDims}) must be less than rank(x) (  
${xRank}).`);  
    }  
    if (axis < batchDims) {  
      throw new Error(`batchDims (${  
batchDims}) must be less than or equal to axis (  
${axis}).`);  
    }  
    for (let  
i = 0; i < batchDims; ++i) {  
      if (x.shape[i] !== indices.shape[i]) {  
        throw new Error(`  
x.shape[${i}]:  
${x.shape[i]} should be equal to indices.shape[${  
indices.shape[i]}]:  
${indices.shape[i]}`);  
      }  
    }  
    const dimSize =  
x.shape[axis];  
    const outputShape: number[] = [];  
    let batchSize = 1;  
    let outerSize = 1;  
    let sliceSize =  
1;  
    for (let i = 0; i < batchDims; ++i) {  
      outputShape.push(x.shape[i]);  
      batchSize *= x.shape[i];  
    }  
    for (let i = batchDims; i < axis; ++i) {  
      outputShape.push(x.shape[i]);  
      outerSize *= x.shape[i];  
    }  
    for (let i = batchDims; i < indicesRank; ++i) {  
      outputShape.push(indices.shape[i]);  
    }  
    for (let i = axis + 1; i <  
xRank; ++i) {  
      outputShape.push(x.shape[i]);  
      sliceSize *= x.shape[i];  
    }  
    return {batchSize, sliceSize,  
outerSize, dimSize, outputShape};  
  }  
  return {batchSize: 1, sliceSize: 1, outerSize: 1,  
dimSize: 1, outputShape: []};  
}  
"/**  
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* WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.  
* See the License for the specific language  
governing permissions and  
* limitations under the License.
```

```
=====  
*  
import {decodeString, encodeString} from './util';  
// Utilities needed by backend consumers of tf-  
core.  
export * from './ops/axis_util';  
export * from './ops/broadcast_util';  
export * from  
 './ops/concat_util';  
export * from './ops/conv_util';  
export * from './ops/fused_util';  
export * from  
 './ops/fused_types';  
export * from './ops/reduce_util';  
import * as slice_util from './ops/slice_util';  
export  
{slice_util};  
export {BackendValues, TypedArray, upcastType, PixelData} from './types';  
export  
{MemoryInfo, TimingInfo} from './engine';  
export * from './ops/rotate_util';  
export * from  
 './ops/array_ops_util';  
export * from './ops/gather_nd_util';  
export * from './ops/scatter_nd_util';  
export * from  
 './ops/selu_util';  
export * from './ops/fused_util';  
export * from './ops/erf_util';  
export * from './log';  
export *  
from './backends/complex_util';  
export * from './ops/split_util';  
import * as segment_util from  
 './ops/segment_util';  
export {segment_util};  
export function fromUint8ToStringArray(vals: Uint8Array[]) {  
  return  
  vals.map(v => String.fromCharCode(v));  
}
```

```
try {\n // Decode the bytes into string.\n return vals.map(val => decodeString(val));\n } catch (err) {\n throw\n new Error(\n `Failed to decode encoded string bytes into utf-8, error: ${err}`);\n }\n}\n\nexport function\n fromStringArrayToUint8(strings: string[]) {\n return strings.map(s => encodeString(s));\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nexport {nonMaxSuppressionV3Impl, nonMaxSuppressionV4Impl, nonMaxSuppressionV5Impl} from\n './non_max_suppression_impl';\n\nexport {whereImpl} from './where_impl';\n\n"/**\n * @license\n * Copyright 2020\n * Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\n// base.ts is tfjs-core without auto registration of things like flags,\n// gradients, chained ops or the opHandler.\nSee base_side_effects.ts for parts of tfjs core that are required side effects.\n\n/**\n * @fileoverview\n * @suppress\n * {partialAlias} Optimization disabled due to passing the module\n * object into a function below:\n * import *\n * as ops from './ops/ops';\n * setOpHandler(ops);\n * \n * // Serialization.\n * import * as io from './io/io';\n * import * as\n * math from './math';\n * import * as browser from './ops/browser';\n * import * as gather_util from\n * './ops/gather_nd_util';\n * import * as scatter_util from './ops/scatter_nd_util';\n * import * as slice_util from\n * './ops/slice_util';\n * import * as serialization from './serialization';\n * import * as tensor_util from './tensor_util';\n * import\n * * as test_util from './test_util';\n * import * as util from './util';\n * import {version} from './version';\n * export\n * {InferenceModel, MetaGraph, MetaGraphInfo, ModelPredictConfig, ModelTensorInfo, SavedModelTensorInfo,\n * SignatureDef, SignatureDefEntry, SignatureDefInfo} from './model_types';\n * // Optimizers.\n * export\n * {AdadeltaOptimizer} from './optimizers/adadelta_optimizer';\n * export {AdagradOptimizer} from\n * './optimizers/adagrad_optimizer';\n * export {AdamOptimizer} from './optimizers/adam_optimizer';\n * export\n * {AdamaxOptimizer} from './optimizers/adamax_optimizer';\n * export {MomentumOptimizer} from\n * './optimizers/momentum_optimizer';\n * export {Optimizer} from './optimizers/optimizer';\n * export\n * {RMSPropOptimizer} from './optimizers/rmsprop_optimizer';\n * export {SGDOptimizer} from\n * './optimizers/sgd_optimizer';\n * export {Scalar, Tensor, Tensor1D, Tensor2D, Tensor3D, Tensor4D, Tensor5D,\n * TensorBuffer, Variable} from './tensor';\n * export {GradSaveFunc, NamedTensorMap, TensorContainer,\n * TensorContainerArray, TensorContainerObject} from './tensor_types';\n * export {BackendValues, DataType,\n * DataTypeMap, DataValues, NumericDataType, PixelData, Rank, RecursiveArray, ScalarLike, ShapeMap,\n * sumOutType, TensorLike, TypedArray, upcastType} from './types';\n * export *\n * from './ops/ops';\n * export\n * {Reduction} from './ops/loss_ops_utils';\n * export *\n * from './train';\n * export *\n * from './globals';\n * export *\n * from\n * './kernel_registry';\n * export {customGrad, grad, grads, valueAndGrad, valueAndGrads, variableGrads} from\n * './gradients';\n * export {TimingInfo, MemoryInfo, ForwardFunc} from './engine';\n * export {Environment, env,\n * ENV} from './environment';\n * export {Platform} from './platforms/platform';\n * export {version as\n * version_core};\n * \n * // Top-level method exports.\n * export {nextFrame} from './browser_util';\n * \n * // Second level\n * exports.\n * import * as backend_util from './backends/backend_util';\n * import * as device_util from\n * './device_util';\n * export {\n * browser,\n * io,\n * math,\n * serialization,\n * test_util,\n * util,\n * backend_util,\n * tensor_util,\n * slice_util,\n * gather_util,\n * scatter_util,\n * device_util\n *};\n * import *\n * as kernel_impls from\n * './backends/kernel_impls';\n * export {kernel_impls};\n * // Backend specific.\n * export {KernelBackend,
```



```

BackendTimingInfo, DataMover, DataStorage} from './backends/backend';\n\n// Export all kernel names /
info.\nexport * from './kernel_names';\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\n// Required side effectful code.\nimport './base_side_effects';\n\n// All exports from this package should be in
base.\nexport * from './base';\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nconst contexts: {[key: string]: WebGLRenderingContext} = {};\n\nconst WEBGL_ATTRIBUTES:
WebGLContextAttributes = {\n  alpha: false,\n  antialias: false,\n  premultipliedAlpha: false,\n
preserveDrawingBuffer: false,\n  depth: false,\n  stencil: false,\n  failIfMajorPerformanceCaveat: true\n};\n\nexport
function clearWebGLContext(webGLVersion: number) {\n  delete contexts[webGLVersion];\n}\n\nexport function
setWebGLContext(\n  webGLVersion: number, gl: WebGLRenderingContext) {\n  contexts[webGLVersion] =
gl;\n}\n\nexport function getWebGLContext(webGLVersion: number): WebGLRenderingContext {\n  if
(!!(webGLVersion in contexts)) {\n    const newCtx = getWebGLRenderingContext(webGLVersion);\n    if (newCtx
!== null) {\n      contexts[webGLVersion] = newCtx;\n    } else {\n      console.log('Could not get context for
WebGL version', webGLVersion);\n      return null;\n    }\n  }\n  const gl = contexts[webGLVersion];\n  if
(gl.isContextLost()) {\n    delete contexts[webGLVersion];\n    return getWebGLContext(webGLVersion);\n  }\n  gl.disable(gl.DEPTH_TEST);\n  gl.disable(gl.STENCIL_TEST);\n  gl.disable(gl.BLEND);\n
gl.disable(gl.DITHER);\n  gl.disable(gl.POLYGON_OFFSET_FILL);\n  gl.disable(gl.SAMPLE_COVERAGE);\n
gl.enable(gl.SCISSOR_TEST);\n  gl.enable(gl.CULL_FACE);\n  gl.cullFace(gl.BACK);\n\n  return
contexts[webGLVersion];\n}\n\nfunction createCanvas(webGLVersion: number) {\n  if (typeof OffscreenCanvas
!== 'undefined' && webGLVersion === 2) {\n    return new OffscreenCanvas(300, 150);\n  } else if (typeof
document !== 'undefined') {\n    return document.createElement('canvas');\n  } else {\n    throw new Error('Cannot
create a canvas in this context');\n  }\n}\n\nfunction getWebGLRenderingContext(webGLVersion: number):
WebGLRenderingContext {\n  if (webGLVersion !== 1 && webGLVersion !== 2) {\n    throw new Error('Cannot
get WebGL rendering context, WebGL is disabled.);\n  }\n  const canvas = createCanvas(webGLVersion);\n\n
canvas.addEventListener('webglcontextlost', (ev: Event) => {\n    ev.preventDefault();\n    delete
contexts[webGLVersion];\n  }, false);\n  if (webGLVersion === 1) {\n    return (canvas.getContext('webgl',
WEBGL_ATTRIBUTES) ||\n      canvas.getContext('experimental-webgl', WEBGL_ATTRIBUTES)) as\n    WebGLRenderingContext;\n  }\n  return canvas.getContext('webgl2', WEBGL_ATTRIBUTES) as
WebGLRenderingContext;\n}\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *
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compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {backend_util, DataId, DataType, env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nexport enum
PackingScheme {\n /**\n * All values in a single texel are densely packed without any constraints.\n *\n * This
is how the shader encodes a tensor with shape = [2, 3, 4]\n * (indices are [batch, row, col]).\n *\n * 000|001
010|011 020|021\n * -----\n * 002|003 012|013 022|023\n *\n * 100|101 110|111
120|121\n * -----\n * 102|103 112|113 122|123\n *\n */\n DENSE,\n /**\n * Single
texels contain only values from the same batch, and from adjacent\n * rows and columns.\n *\n * This is how the
shader encodes a tensor with shape = [2, 3, 5]\n * (indices are [batch, row, col]).\n *\n * 000|001 002|003
004|xxx 020|021 022|023 024|xxx\n * -----\n * 010|011 012|013
014|xxx xxx|xxx xxx|xxx xxx|xxx\n *\n * 100|101 102|103 104|xxx 120|121 122|123 124|xxx\n * -----
-\n * 110|111 112|113 114|xxx xxx|xxx xxx|xxx xxx|xxx\n *\n */\n
SHARED_BATCH\n}\n\nexport enum TextureUsage {\n RENDER,\n UPLOAD,\n PIXELS,\n
DOWNLOAD\n}\n\nexport enum PhysicalTextureType {\n UNPACKED_FLOAT16,\n
UNPACKED_FLOAT32,\n PACKED_4X1_UNSIGNED_BYTE,\n PACKED_2X2_FLOAT32,\n
PACKED_2X2_FLOAT16\n}\n\nexport interface TextureData {\n // Required.\n shape: number[];\n dtype:
DataType;\n\n // Optional.\n values?: backend_util.BackendValues;\n texture?: WebGLTexture;\n // For complex
numbers, the real and imaginary parts are stored as their own\n // individual tensorInfos, with a parent joining the
two with the\n // complexTensors field. When this is defined, texture will be null.\n complexTensorInfos?: {real:
TensorInfo, imag: TensorInfo};\n /** [rows, columns] shape of the texture. *\n texShape?: [number, number];\n
usage?: TextureUsage;\n isPacked?: boolean;\n\n refCount: number;\n\n // Available when the tensor has been
sliced.\n slice?: {\n // Offset in the 'flat index' space.\n flatOffset: number;\n // Used for counting how many
sliced tensors point to the same texture.\n origDataId: DataId;\n };\n}\n\nexport function
getUnpackedMatrixTextureShapeWidthHeight(\n rows: number, columns: number): [number, number] {\n return
[columns, rows];\n}\n\nexport function getUnpackedArraySizeFromMatrixSize(\n matrixSize: number,
channelsPerTexture: number): number {\n return matrixSize * channelsPerTexture;\n}\n\nexport function
getColorMatrixTextureShapeWidthHeight(\n rows: number, columns: number): [number, number] {\n return
[columns * 4, rows];\n}\n\n/**\n * Get shape for densely packed RGBA texture.\n */\nexport function
getDenseTexShape(shape: number[]): [number, number] {\n const size = util.sizeFromShape(shape);\n const
texelsNeeded = Math.ceil(size / 4);\n return util.sizeToSquarishShape(texelsNeeded);\n}\n\nexport function
getMatrixSizeFromUnpackedArraySize(\n unpackedSize: number, channelsPerTexture: number): number {\n if
(unpackedSize % channelsPerTexture !== 0) {\n throw new Error(\n `unpackedSize (${unpackedSize}) must
be a multiple of ` +\n ` ${channelsPerTexture}`);\n }\n return unpackedSize / channelsPerTexture;\n}\n\nexport
function decodeMatrixFromUnpackedColorRGBAArray(\n unpackedArray: Float32Array, matrix: Float32Array,
channels: number) {\n const requiredSize = unpackedArray.length * channels / 4;\n if (matrix.length <
requiredSize) {\n throw new Error(\n `matrix length (${matrix.length}) must be >= ${requiredSize}`);\n }\n
let dst = 0;\n for (let src = 0; src < unpackedArray.length; src += 4) {\n for (let c = 0; c < channels; c++) {\n
matrix[dst++] = unpackedArray[src + c];\n }\n }\n}\n\nexport function
getPackedMatrixTextureShapeWidthHeight(\n rows: number, columns: number): [number, number] {\n return [\n
Math.max(1, Math.ceil(columns / 2)), Math.max(1, Math.ceil(rows / 2))\n ];\n}\n\nexport function
getPackedRGBAArraySizeFromMatrixShape(\n rows: number, columns: number): number {\n const [w, h] =
getPackedMatrixTextureShapeWidthHeight(rows, columns);\n return w * h * 4;\n}\n\nexport interface
TextureConfig {\n internalFormatFloat: number;\n textureFormatFloat: number;\n
internalFormatPackedHalfFloat: number;\n internalFormatHalfFloat: number;\n internalFormatPackedFloat:
number;\n\n // The format to use during a gl.readPixels call.\n downloadTextureFormat: number;\n // How many
channels need to be unpacked after a gl.readPixels call.\n downloadUnpackNumChannels: number;\n\n defaultNumChannels: number;\n textureTypeHalfFloat: number;\n textureTypeFloat: number;\n}\n\nexport
function getTextureConfig(\n // tslint:disable-next-line:no-any\n gl: WebGLRenderingContext,
textureHalfFloatExtension?: any): TextureConfig {\n // tslint:disable-next-line:no-any\n const glany = gl as

```

```

any;\n\n let internalFormatFloat: number;\n let internalFormatHalfFloat: number;\n let
internalFormatPackedHalfFloat: number;\n let internalFormatPackedFloat: number;\n let textureFormatFloat:
number;\n\n let downloadTextureFormat: number;\n let downloadUnpackNumChannels: number;\n\n let
defaultNumChannels: number;\n let textureTypeHalfFloat: number;\n let textureTypeFloat: number;\n\n if
(env().getNumber('WEBGL_VERSION') === 2) {\n  internalFormatFloat = glanyl.R32F;\n
internalFormatHalfFloat = glanyl.R16F;\n  internalFormatPackedHalfFloat = glanyl.RGBA16F;\n
internalFormatPackedFloat = glanyl.RGBA32F;\n  textureFormatFloat = glanyl.RED;\n
downloadUnpackNumChannels = 4;\n  defaultNumChannels = 1;\n  textureTypeHalfFloat =
glanyl.HALF_FLOAT;\n  textureTypeFloat = glanyl.FLOAT;\n } else {\n  internalFormatFloat = gl.RGBA;\n
internalFormatHalfFloat = gl.RGBA;\n  internalFormatPackedHalfFloat = gl.RGBA;\n
internalFormatPackedFloat = glanyl.RGBA;\n  textureFormatFloat = gl.RGBA;\n  downloadUnpackNumChannels
= 4;\n  defaultNumChannels = 4;\n  textureTypeHalfFloat = textureHalfFloatExtension != null ?\n
textureHalfFloatExtension.HALF_FLOAT_OES :\n  null;\n  textureTypeFloat = gl.FLOAT;\n }\n
downloadTextureFormat = gl.RGBA;\n\n return {\n  internalFormatFloat,\n  internalFormatHalfFloat,\n
internalFormatPackedHalfFloat,\n  internalFormatPackedFloat,\n  textureFormatFloat,\n
downloadTextureFormat,\n  downloadUnpackNumChannels,\n  defaultNumChannels,\n
textureTypeHalfFloat,\n  textureTypeFloat\n };\n\n","**\n * @license\n * Copyright 2017 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {getWebGLContext} from
'./canvas_util';\n\nimport {getTextureConfig} from './tex_util';\n\nexport function callAndCheck<T>(gl:
WebGLRenderingContext, func: () => T): T {\n  const returnValue = func();\n  if (env().getBool('DEBUG')) {\n
checkWebGLError(gl);\n  }\n  return returnValue;\n}\n\nfunction checkWebGLError(gl: WebGLRenderingContext)
{\n  const error = gl.getError();\n  if (error !== gl.NO_ERROR) {\n    throw new Error('WebGL Error: ' +
getWebGLErrorMessage(gl, error));\n  }\n}\n\n// https://en.wikipedia.org/wiki/Half-precision_floating-
point_format\n\nconst MIN_FLOAT16 = 5.96e-8;\nconst MAX_FLOAT16 = 65504;\n\nexport function
canBeRepresented(num: number): boolean {\n  if (env().getBool('WEBGL_RENDER_FLOAT32_ENABLED') ||
num === 0 ||\n  (MIN_FLOAT16 < Math.abs(num) && Math.abs(num) < MAX_FLOAT16)) {\n    return true;\n
}\n  return false;\n}\n\nexport function getWebGLErrorMessage(\n  gl: WebGLRenderingContext, status: number):
string {\n  switch (status) {\n    case gl.NO_ERROR:\n      return 'NO_ERROR';\n    case gl.INVALID_ENUM:\n
return 'INVALID_ENUM';\n    case gl.INVALID_VALUE:\n      return 'INVALID_VALUE';\n    case
gl.INVALID_OPERATION:\n      return 'INVALID_OPERATION';\n    case
gl.INVALID_FRAMEBUFFER_OPERATION:\n      return 'INVALID_FRAMEBUFFER_OPERATION';\n    case
gl.OUT_OF_MEMORY:\n      return 'OUT_OF_MEMORY';\n    case gl.CONTEXT_LOST_WEBGL:\n      return
'CONTEXT_LOST_WEBGL';\n    default:\n      return `Unknown error code ${status}`;\n  }\n}\n\nexport function
getExtensionOrThrow(\n  gl: WebGLRenderingContext, extensionName: string): {} {\n  return
throwIfNull<{}>(\n    gl, () => gl.getExtension(extensionName),\n    `Extension "${extensionName}" not
supported on this browser.`);\n}\n\nexport function createVertexShader(\n  gl: WebGLRenderingContext,
vertexShaderSource: string): WebGLShader {\n  const vertexShader: WebGLShader =
throwIfNull<WebGLShader>(\n    gl, () => gl.createShader(gl.VERTEX_SHADER),\n    `Unable to create vertex
WebGLShader.`);\n  callAndCheck(gl, () => gl.shaderSource(vertexShader, vertexShaderSource));\n
callAndCheck(gl, () => gl.compileShader(vertexShader));\n  if (gl.getShaderParameter(vertexShader,
gl.COMPILE_STATUS) === false) {\n    console.log(gl.getShaderInfoLog(vertexShader));\n    throw new

```

```

Error('Failed to compile vertex shader.');
```

```

}
return vertexShader;
}

export function
createFragmentShader(gl: WebGLRenderingContext, fragmentShaderSource: string): WebGLShader {
  const
  fragmentShader: WebGLShader = throwIfNull<WebGLShader>(
    gl, () =>
    gl.createShader(gl.FRAGMENT_SHADER),
    'Unable to create fragment WebGLShader.');
```

```

  callAndCheck(gl, () => gl.shaderSource(fragmentShader, fragmentShaderSource));
  callAndCheck(gl, () =>
  gl.compileShader(fragmentShader));
  if (gl.getShaderParameter(fragmentShader, gl.COMPILE_STATUS) ===
  false) {
    logShaderSourceAndInfoLog(
      fragmentShaderSource, gl.getShaderInfoLog(fragmentShader));
    throw new Error('Failed to compile fragment shader.');
```

```

  }
  return fragmentShader;
}

const lineNumberRegex
= /ERROR: [0-9]+:([0-9]+)/g;
function logShaderSourceAndInfoLog(
  shaderSource: string, shaderInfoLog:
  string) {
  const lineNumberRegexResult = lineNumberRegex.exec(shaderInfoLog);
  if (lineNumberRegexResult
  == null) {
    console.log(`Couldn't parse line number in error: ${shaderInfoLog}`);
    console.log(shaderSource);
    return;
  }
  const lineNumber = +lineNumberRegexResult[1];
  const
  shaderLines = shaderSource.split('\n');
  const pad = shaderLines.length.toString().length + 2;
  const
  linesWithLineNumbers = shaderLines.map(
    (line, lineNumber) =>
    util.rightPad((lineNumber +
  1).toString(), pad) + line);
  let maxLineLength = 0;
  for (let i = 0; i < linesWithLineNumbers.length; i++) {
    maxLineLength = Math.max(
      linesWithLineNumbers[i].length, maxLineLength);
  }
  const beforeErrorLines =
  linesWithLineNumbers.slice(0, lineNumber - 1);
  const errorLine = linesWithLineNumbers.slice(
    lineNumber - 1,
    lineNumber);
  const afterErrorLines =
  linesWithLineNumbers.slice(lineNumber);
  console.log(
    beforeErrorLines.join('\n'));
  console.log(
    shaderInfoLog.split('\n')[0]);
  console.log(
    `%c
    ${util.rightPad(errorLine[0], maxLineLength)}
    `);
  console.log(
    'border: 1px solid red; background-color: #e3d2d2;
    color: #a61717');
  console.log(
    afterErrorLines.join('\n'));
}

export function createProgram(
  gl:
  WebGLRenderingContext): WebGLProgram {
  return throwIfNull<WebGLProgram>(
    gl, () =>
    gl.createProgram(),
    'Unable to create WebGLProgram.');
```

```

}

export function linkProgram(
  gl:
  WebGLRenderingContext, program: WebGLProgram) {
  callAndCheck(gl, () => gl.linkProgram(program));
  if
  (gl.getProgramParameter(program, gl.LINK_STATUS) === false) {
    console.log(
      gl.getProgramInfoLog(program));
    throw new Error('Failed to link vertex and fragment shaders.');
```

```

  }
}

export function validateProgram(
  gl:
  WebGLRenderingContext, program: WebGLProgram) {
  callAndCheck(gl, () => gl.validateProgram(program));
  if
  (gl.getProgramParameter(program,
  gl.VALIDATE_STATUS) === false) {
    console.log(
      gl.getProgramInfoLog(program));
    throw new
    Error('Shader program validation failed.');
```

```

  }
}

export function createStaticVertexBuffer(
  gl:
  WebGLRenderingContext, data: Float32Array): WebGLBuffer {
  const buffer: WebGLBuffer =
  throwIfNull<WebGLBuffer>(
    gl, () => gl.createBuffer(),
    'Unable to create WebGLBuffer');
```

```

  callAndCheck(gl, () => gl.bindBuffer(gl.ARRAY_BUFFER, buffer));
  callAndCheck(gl, () =>
  gl.bufferData(gl.ARRAY_BUFFER, data, gl.STATIC_DRAW));
  return buffer;
}

export function
createStaticIndexBuffer(
  gl:
  WebGLRenderingContext, data: Uint16Array): WebGLBuffer {
  const buffer:
  WebGLBuffer = throwIfNull<WebGLBuffer>(
    gl, () => gl.createBuffer(),
    'Unable to create WebGLBuffer');
```

```

  callAndCheck(gl, () => gl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER, buffer));
  callAndCheck(
    gl, () =>
    gl.bufferData(gl.ELEMENT_ARRAY_BUFFER, data, gl.STATIC_DRAW));
  return buffer;
}

export
function getNumChannels(): number {
  if (env().getNumber('WEBGL_VERSION') === 2) {
    return 1;
  }
  return 4;
}

export function createTexture(
  gl:
  WebGLRenderingContext): WebGLTexture {
  return
  throwIfNull<WebGLTexture>(
    gl, () => gl.createTexture(),
    'Unable to create WebGLTexture.');
```

```

}

export function validateTextureSize(
  width: number, height: number) {
  const maxTextureSize =
  env().getNumber('WEBGL_MAX_TEXTURE_SIZE');
  if ((width <= 0) || (height <= 0)) {
    const requested =
    `${width}x${height}`;
    throw new Error('Requested texture size ' +
    requested + ' is invalid.');
```

```

  }
  if ((width > maxTextureSize) || (height > maxTextureSize)) {
    const requested =
    `${width}x${height}`;
    const max =
    `${maxTextureSize}x${maxTextureSize}`;
    throw new Error(
      '\n Requested texture size ' + requested + '\n
      ' greater than WebGL maximum on this browser / GPU ' +
      max + '.');
```

```

  }
}

export function
createFramebuffer(
  gl:
  WebGLRenderingContext): WebGLFramebuffer {
  return

```

```

throwIfNull<WebGLFramebuffer>(\n    gl, () => gl.createFramebuffer(), 'Unable to create
WebGLFramebuffer.');
```

```

}\n\nexport function bindVertexBufferToProgramAttribute(\n    gl:
WebGLRenderingContext, program: WebGLProgram, attribute: string,\n    buffer: WebGLBuffer,
arrayEntriesPerItem: number, itemStrideInBytes: number,\n    itemOffsetInBytes: number): boolean {\n    const loc =
gl.getAttribLocation(program, attribute);\n    if (loc === -1) {\n        // The GPU compiler decided to strip out this
attribute because it's unused,\n        // thus no need to bind.\n        return false;\n    }\n    callAndCheck(gl, () =>
gl.bindBuffer(gl.ARRAY_BUFFER, buffer));\n    callAndCheck(\n        gl,\n        () => gl.vertexAttribPointer(\n
loc, arrayEntriesPerItem, gl.FLOAT, false, itemStrideInBytes,\n        itemOffsetInBytes));\n    callAndCheck(gl, ()
=> gl.enableVertexAttribArray(loc));\n    return true;\n}\n\nexport function bindTextureUnit(\n    gl:
WebGLRenderingContext, texture: WebGLTexture, textureUnit: number) {\n    validateTextureUnit(gl,
textureUnit);\n    callAndCheck(gl, () => gl.activeTexture(gl.TEXTURE0 + textureUnit));\n    callAndCheck(gl, () =>
gl.bindTexture(gl.TEXTURE_2D, texture));\n}\n\nexport function unbindTextureUnit(\n    gl:
WebGLRenderingContext, textureUnit: number) {\n    validateTextureUnit(gl, textureUnit);\n    callAndCheck(gl, ()
=> gl.activeTexture(gl.TEXTURE0 + textureUnit));\n    callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D,
null));\n}\n\nexport function getProgramUniformLocationOrThrow(\n    gl: WebGLRenderingContext, program:
WebGLProgram,\n    uniformName: string): WebGLUniformLocation {\n    return
throwIfNull<WebGLUniformLocation>(\n        gl, () => gl.getUniformLocation(program, uniformName),\n        'uniform \'' + uniformName + '\' not present in program.');
```

```

}\n\nexport function getProgramUniformLocation(\n    gl: WebGLRenderingContext, program: WebGLProgram,\n    uniformName: string): WebGLUniformLocation {\n    return
gl.getUniformLocation(program, uniformName);\n}\n\nexport function
bindTextureToProgramUniformSampler(\n    gl: WebGLRenderingContext, texture: WebGLTexture,\n    uniformSamplerLocation: WebGLUniformLocation, textureUnit: number) {\n    callAndCheck(gl, () =>
bindTextureUnit(gl, texture, textureUnit));\n    callAndCheck(gl, () => gl.uniform1i(uniformSamplerLocation,
textureUnit));\n}\n\nexport function bindCanvasToFramebuffer(gl: WebGLRenderingContext) {\n
callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER, null));\n    callAndCheck(gl, () => gl.viewport(0, 0,
gl.canvas.width, gl.canvas.height));\n    callAndCheck(gl, () => gl.scissor(0, 0, gl.canvas.width,
gl.canvas.height));\n}\n\nexport function bindColorTextureToFramebuffer(\n    gl: WebGLRenderingContext,
texture: WebGLTexture,\n    framebuffer: WebGLFramebuffer) {\n    callAndCheck(gl, () =>
gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer));\n    callAndCheck(\n        gl,\n        () =>
gl.framebufferTexture2D(\n            gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture,
0));\n}\n\nexport function unbindColorTextureFromFramebuffer(\n    gl: WebGLRenderingContext, framebuffer:
WebGLFramebuffer) {\n    callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer));\n    callAndCheck(\n        gl,\n        () => gl.framebufferTexture2D(\n            gl.FRAMEBUFFER,
gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, null, 0));\n}\n\nexport function validateFramebuffer(gl:
WebGLRenderingContext) {\n    const status = gl.checkFramebufferStatus(gl.FRAMEBUFFER);\n    if (status !==
gl.FRAMEBUFFER_COMPLETE) {\n        throw new Error(\n            'Error binding framebuffer: ' +
getFramebufferErrorMessage(gl, status));\n    }\n}\n\nexport function getFramebufferErrorMessage(\n    gl:
WebGLRenderingContext, status: number): string {\n    switch (status) {\n        case
gl.FRAMEBUFFER_INCOMPLETE_ATTACHMENT:\n            return
'FRAMEBUFFER_INCOMPLETE_ATTACHMENT';\n        case
gl.FRAMEBUFFER_INCOMPLETE_MISSING_ATTACHMENT:\n            return
'FRAMEBUFFER_INCOMPLETE_MISSING_ATTACHMENT';\n        case
gl.FRAMEBUFFER_INCOMPLETE_DIMENSIONS:\n            return
'FRAMEBUFFER_INCOMPLETE_DIMENSIONS';\n        case gl.FRAMEBUFFER_UNSUPPORTED:\n            return
'FRAMEBUFFER_UNSUPPORTED';\n        default:\n            return `unknown error ${status}`;\n    }\n}\n\nfunction
throwIfNull<T>(\n    gl: WebGLRenderingContext, returnTOrNull: () => T | null,\n    failureMessage: string): T {\n    const tOrNull: T | null = callAndCheck(gl, () => returnTOrNull());\n    if (tOrNull === null) {\n        throw new
Error(failureMessage);\n    }\n    return tOrNull;\n}\n\nfunction validateTextureUnit(gl: WebGLRenderingContext,
```

```

textureUnit: number) {\n  const maxTextureUnit = gl.MAX_COMBINED_TEXTURE_IMAGE_UNITS - 1;\n  const glTextureUnit = textureUnit + gl.TEXTURE0;\n  if (glTextureUnit < gl.TEXTURE0 || glTextureUnit >\n  maxTextureUnit) {\n    const textureUnitRange = `[gl.TEXTURE0, gl.TEXTURE${maxTextureUnit}]`;\n    throw\n    new Error(`textureUnit must be in ${textureUnitRange}.`);\n  }\n}\n\nexport function getBatchDim(shape:\nnumber[], dimsToSkip = 2): number {\n  return util.sizeFromShape(shape.slice(0, shape.length -\ndimsToSkip));\n}\n\nexport function getRowsCols(shape: number[]): [number, number] {\n  if (shape.length === 0)\n  {\n    throw Error('Cannot get rows and columns of an empty shape array.);\n  }\n  return [shape.length > 1 ?\n  shape[shape.length - 2] : 1, shape[shape.length - 1] ];\n}\n\nexport function getShapeAs3D(shape: number[]):\n[number, number, number] {\n  let shapeAs3D: [number, number, number] = [1, 1, 1];\n  const isScalar =\n  shape.length === 0 || (shape.length === 1 && shape[0] === 1);\n  if (!isScalar) {\n    shapeAs3D =\n    [getBatchDim(shape), ...getRowsCols(shape)] as [number, number, number];\n  }\n  return\n  shapeAs3D;\n}\n\nexport function getTextureShapeFromLogicalShape(\n  logShape: number[], isPacked = false):\n  [number, number] {\n  let maxTexSize = env().getNumber('WEBGL_MAX_TEXTURE_SIZE');\n  if (isPacked) {\n    maxTexSize = maxTexSize * 2;\n    // This logic ensures we accurately count the number of packed texels\n    needed\n    // to accommodate the tensor. We can only pack values in the same texel if\n    // they are from adjacent\n    pairs of rows/cols within the same batch. So if a\n    // tensor has 3 rows, we pretend it has 4 rows in order to account\n    for the\n    // fact that the texels containing the third row are half empty.\n    logShape = logShape.map((d, i)\n    => i >= logShape.length - 2 ?\n    util.nearestLargerEven(logShape[i]) : logShape[i]);\n    // Packed\n    texture height is at least 2 (the channel height of a single\n    // texel).\n    if (logShape.length === 1) {\n      logShape = [2, logShape[0]];\n    }\n    // If logical shape is 2, we don't squeeze, since we want to match\n    physical.\n    if (logShape.length !== 2) {\n      const squeezeResult = util.squeezeShape(logShape);\n      logShape =\n      squeezeResult.newShape;\n    }\n    let size = util.sizeFromShape(logShape);\n    if (logShape.length <= 1 && size <=\n    maxTexSize) {\n      return [1, size];\n    } else if (\n    logShape.length === 2 && logShape[0] <= maxTexSize &&\n    logShape[1] <= maxTexSize) {\n      return logShape as [number, number];\n    } else if (\n    logShape.length ===\n    3 && logShape[0] * logShape[1] <= maxTexSize &&\n    logShape[2] <= maxTexSize) {\n      return [logShape[0]\n    * logShape[1], logShape[2]];\n    } else if (\n    logShape.length === 3 && logShape[0] <= maxTexSize &&\n    logShape[1] * logShape[2] <= maxTexSize) {\n      return [logShape[0], logShape[1] * logShape[2]];\n    } else if (\n    logShape.length === 4 &&\n    logShape[0] * logShape[1] * logShape[2] <= maxTexSize &&\n    logShape[3]\n    <= maxTexSize) {\n      return [logShape[0] * logShape[1] * logShape[2], logShape[3]];\n    } else if (\n    logShape.length === 4 && logShape[0] <= maxTexSize &&\n    logShape[1] * logShape[2] * logShape[3] <=\n    maxTexSize) {\n      return [logShape[0], logShape[1] * logShape[2] * logShape[3]];\n    } else {\n      if (isPacked) {\n        // For packed textures size equals the number of channels required to\n        // accommodate the texture data.\n        However in order to squarify such that\n        // inner dimensions stay even, we rewrite size to equal the number of\n        // texels. Then in the return statement we rehydrate the squarified\n        // dimensions to channel units.\n        const\n        batchDim = getBatchDim(logShape);\n        let rows = 2, cols = 2;\n        if (logShape.length) {\n          [rows, cols] =\n          getRowsCols(logShape);\n        }\n        size = batchDim * (rows / 2) * (cols / 2);\n        return\n        util.sizeToSquarishShape(size).map(d => d * 2) as [number, number];\n      }\n      return\n      util.sizeToSquarishShape(size);\n    }\n  }\n}\n\nfunction isEven(n: number): boolean {\n  return n % 2 ===\n  0;\n}\n\n/**\n * This determines whether reshaping a packed texture requires rearranging\n * the data within the\n * texture, assuming 2x2 packing.\n */\nexport function isReshapeFree(shape1: number[], shape2: number[]): boolean\n{\n  shape1 = shape1.slice(-2);\n  shape2 = shape2.slice(-2);\n  if (util.arraysEqual(shape1, shape2)) {\n    return\n    true;\n  }\n  if (!shape1.length || !shape2.length) {\n    // One of the shapes is a scalar.\n    return true;\n  }\n  if\n  (shape1[0] === 0 || shape1[1] === 0 || shape2[0] === 0 ||\n  shape2[1] === 0) {\n    return true;\n  }\n  if\n  (shape1.length !== shape2.length) {\n    // One of the shapes is a vector.\n    const shape1Cols = shape1.slice(-1)[0];\n    const shape2Cols = shape2.slice(-1)[0];\n    if (shape1Cols === shape2Cols) {\n      return true;\n    }\n    if\n    (isEven(shape1Cols) && isEven(shape2Cols) &&\n    (shape1[0] === 1 || shape2[0] === 1)) {\n      return true;\n    }\n  }\n  return shape1[1] === shape2[1] && isEven(shape1[0]) && isEven(shape2[0]);\n}\n\n// We cache webgl\nparams because the environment gets reset between\n// unit tests and we don't want to constantly query the

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WebGLContext for\n// MAX_TEXTURE_SIZE.\nlet MAX_TEXTURE_SIZE: number;\nlet
MAX_TEXTURES_IN_SHADER: number;\n\nexport function getWebGLMaxTextureSize(webGLVersion:
number): number {\n if (MAX_TEXTURE_SIZE == null) {\n const gl = getWebGLContext(webGLVersion);\n
MAX_TEXTURE_SIZE = gl.getParameter(gl.MAX_TEXTURE_SIZE);\n } \n return
MAX_TEXTURE_SIZE;\n}\n\nexport function resetMaxTextureSize() {\n MAX_TEXTURE_SIZE =
null;\n}\n\nexport function resetMaxTexturesInShader() {\n MAX_TEXTURES_IN_SHADER = null;\n}\n\nexport
function getMaxTexturesInShader(webGLVersion: number): number {\n if (MAX_TEXTURES_IN_SHADER ==
null) {\n const gl = getWebGLContext(webGLVersion);\n MAX_TEXTURES_IN_SHADER =
gl.getParameter(gl.MAX_TEXTURE_IMAGE_UNITS);\n } \n // We cap at 16 to avoid spurious runtime \"memory
exhausted\" error.\n return Math.min(16, MAX_TEXTURES_IN_SHADER);\n}\n\n\nexport function
getWebGLDisjointQueryTimerVersion(webGLVersion: number): number {\n if (webGLVersion === 0) {\n
return 0;\n } \n\n let queryTimerVersion: number;\n const gl = getWebGLContext(webGLVersion);\n\n if
(hasExtension(gl, 'EXT_disjoint_timer_query_webgl2') &&\n webGLVersion === 2) {\n queryTimerVersion =
2;\n } else if (hasExtension(gl, 'EXT_disjoint_timer_query')) {\n queryTimerVersion = 1;\n } else {\n
queryTimerVersion = 0;\n } \n return queryTimerVersion;\n}\n\n\nexport function hasExtension(gl:
WebGLRenderingContext, extensionName: string) {\n const ext = gl.getExtension(extensionName);\n return ext !=
null;\n}\n\n\nexport function isWebGLVersionEnabled(webGLVersion: 1|2) {\n try {\n const gl =
getWebGLContext(webGLVersion);\n if (gl != null) {\n return true;\n } \n } catch (e) {\n console.log('Error
when getting WebGL context: ', e);\n return false;\n } \n return false;\n}\n\n\nexport function
isCapableOfRenderingToFloatTexture(webGLVersion: number): boolean {\n if (webGLVersion === 0) {\n
return false;\n } \n\n const gl = getWebGLContext(webGLVersion);\n\n if (webGLVersion === 1) {\n if
(!hasExtension(gl, 'OES_texture_float')) {\n return false;\n } \n } else {\n if (!hasExtension(gl,
'EXT_color_buffer_float')) {\n return false;\n } \n } \n\n const isFrameBufferComplete =
createFloatTextureAndBindToFramebuffer(gl);\n return isFrameBufferComplete;\n}\n\n\n/**\n * Check if we can
download values from a float/half-float texture.\n *\n * Note that for performance reasons we use binding a texture
to a framebuffer\n * as a proxy for ability to download float values later using readPixels. The\n * texture params of
this texture will not match those in readPixels exactly\n * but if we are unable to bind some kind of float texture to
the framebuffer\n * then we definitely will not be able to read float values from it.\n */\n\nexport function
isDownloadFloatTextureEnabled(webGLVersion: number): boolean {\n if (webGLVersion === 0) {\n return
false;\n } \n\n const gl = getWebGLContext(webGLVersion);\n\n if (webGLVersion === 1) {\n if
(!hasExtension(gl, 'OES_texture_float')) {\n return false;\n } \n if (!hasExtension(gl,
'WEBGL_color_buffer_float')) {\n return false;\n } \n } else {\n if (hasExtension(gl,
'EXT_color_buffer_float')) {\n return createFloatTextureAndBindToFramebuffer(gl);\n } \n\n const
COLOR_BUFFER_HALF_FLOAT = 'EXT_color_buffer_half_float';\n if (hasExtension(gl,
COLOR_BUFFER_HALF_FLOAT)) {\n const textureHalfFloatExtension =\n
gl.getExtension(COLOR_BUFFER_HALF_FLOAT);\n return
createHalfFloatTextureAndBindToFramebuffer(\n gl, textureHalfFloatExtension);\n } \n\n return false;\n
} \n\n const isFrameBufferComplete = createFloatTextureAndBindToFramebuffer(gl);\n return
isFrameBufferComplete;\n}\n\n\nfunction createFloatTextureAndBindToFramebuffer(gl:
WebGLRenderingContext): boolean {\n const texConfig = getTextureConfig(gl);\n\n const texture =
gl.createTexture();\n gl.bindTexture(gl.TEXTURE_2D, texture);\n\n const width = 1;\n const height = 1;\n
gl.texImage2D(\n gl.TEXTURE_2D, 0, texConfig.internalFormatFloat, width, height, 0,\n
texConfig.textureFormatFloat, texConfig.textureTypeFloat, null);\n\n const framebuffer =
gl.createFramebuffer();\n gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer);\n gl.framebufferTexture2D(\n
gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture, 0);\n\n const
isFrameBufferComplete =\n gl.checkFramebufferStatus(gl.FRAMEBUFFER) ===
gl.FRAMEBUFFER_COMPLETE;\n\n gl.bindTexture(gl.TEXTURE_2D, null);\n
gl.bindFramebuffer(gl.FRAMEBUFFER, null);\n gl.deleteTexture(texture);\n

```

```

gl.deleteFramebuffer(frameBuffer);\n\n return isFramebufferComplete;\n}\n\nfunction
createHalfFloatTextureAndBindToFramebuffer(\n // tslint:disable-next-line:no-any\n gl:
WebGLRenderingContext, textureHalfFloatExtension: any): boolean {\n const texConfig = getTextureConfig(gl,
textureHalfFloatExtension);\n const texture = gl.createTexture();\n gl.bindTexture(gl.TEXTURE_2D, texture);\n\n
const width = 1;\n const height = 1;\n gl.texImage2D(\n gl.TEXTURE_2D, 0,
texConfig.internalFormatHalfFloat, width, height, 0,\n texConfig.textureFormatFloat,
texConfig.textureTypeHalfFloat, null);\n\n const framebuffer = gl.createFramebuffer();\n
gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer);\n gl.framebufferTexture2D(\n gl.FRAMEBUFFER,
gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture, 0);\n\n const isFramebufferComplete =\n
gl.checkFramebufferStatus(gl.FRAMEBUFFER) === gl.FRAMEBUFFER_COMPLETE;\n\n
gl.bindTexture(gl.TEXTURE_2D, null);\n gl.bindFramebuffer(gl.FRAMEBUFFER, null);\n
gl.deleteTexture(texture);\n gl.deleteFramebuffer(frameBuffer);\n\n return isFramebufferComplete;\n}\n\nexport
function isWebGLFenceEnabled(webGLVersion: number) {\n if (webGLVersion !== 2) {\n return false;\n }\n
const gl = getWebGLContext(webGLVersion);\n\n // tslint:disable-next-line:no-any\n const isEnabled = (gl as
any).fenceSync != null;\n return isEnabled;\n}\n\nexport function assertNotComplex(\n tensor:
TensorInfo|TensorInfo[], opName: string): void {\n if (!Array.isArray(tensor)) {\n tensor = [tensor];\n }\n
tensor.forEach(t => {\n if (t != null) {\n util.assert(\n t.dtype !== 'complex64',\n () => `${opName}
does not support complex64 tensors` +\n 'in the WebGL backend.);\n }\n });\n}\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {device_util, env} from '@tensorflow/tfjs-core';\n\nimport {getMaxTexturesInShader,
getWebGLDisjointQueryTimerVersion, getWebGLMaxTextureSize, isCapableOfRenderingToFloatTexture,
isDownloadFloatTextureEnabled, isWebGLFenceEnabled, isWebGLVersionEnabled} from './webgl_util';\n\nconst
ENV = env();\n\n/**\n * This file contains WebGL-specific flag registrations.\n *\n\n * True if WebGL is
supported.\n *\n\nENV.registerFlag('HAS_WEBGL', () => ENV.getNumber('WEBGL_VERSION') > 0);\n\n\n0:
No WebGL, 1: WebGL 1.0, 2: WebGL 2.0. *\n\nENV.registerFlag('WEBGL_VERSION', () => {\n if
(isWebGLVersionEnabled(2)) {\n return 2;\n } else if (isWebGLVersionEnabled(1)) {\n return 1;\n }\n
return 0;\n});\n\n\n** Whether to check for numerical representation problems.
*\n\nENV.registerFlag('WEBGL_CHECK_NUMERICAL_PROBLEMS', () => false);\n\n\nENV.registerFlag(\n
'WEBGL_BUFFER_SUPPORTED', () => ENV.get('WEBGL_VERSION') === 2);\n\n\n** Whether the WebGL
backend will sometimes forward ops to the CPU. *\n\nENV.registerFlag('WEBGL_CPU_FORWARD', () =>
true);\n\n\n** Whether the WebGL backend will always use f16 textures for rendering.
*\n\nENV.registerFlag('WEBGL_FORCE_F16_TEXTURES', () => false);\n\n\n** Whether to turn all packing related
flags on. *\n\nENV.registerFlag('WEBGL_PACK', () => ENV.getBool('HAS_WEBGL'));\n\n\n** Whether we will
pack the batchnormalization op. *\n\nENV.registerFlag('WEBGL_PACK_NORMALIZATION', () =>
ENV.getBool('WEBGL_PACK'));\n\n\n** Whether we will pack the clip op.
*\n\nENV.registerFlag('WEBGL_PACK_CLIP', () => ENV.getBool('WEBGL_PACK'));\n\n\n** Whether we will
pack the depthwise conv op. *\n\n// TODO:
https://github.com/tensorflow/tfjs/issues/1679\n\nENV.registerFlag('WEBGL_PACK_DEPTHWISECONV', () =>
false);\n\n\n** Whether we will pack binary ops. *\n\nENV.registerFlag(\n
'WEBGL_PACK_BINARY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));\n\n\n** Whether we will pack
unary ops. *\n\nENV.registerFlag(\n 'WEBGL_PACK_UNARY_OPERATIONS', () =>
ENV.getBool('WEBGL_PACK'));\n\n\n** Whether we will pack array ops. *\n\nENV.registerFlag(\n

```



```

'WEBGL_PACK_ARRAY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));
\n\n** Whether we will pack image ops.
*\nENV.registerFlag(\n 'WEBGL_PACK_IMAGE_OPERATIONS', () =>
ENV.getBool('WEBGL_PACK'));
\n\n** Whether we will pack reduce ops.
*\nENV.registerFlag('WEBGL_PACK_REDUCE', () => ENV.getBool('WEBGL_PACK'));
\n\n** Whether packed WebGL kernels lazily unpack their outputs.
*\nENV.registerFlag('WEBGL_LAZILY_UNPACK', () =>
ENV.getBool('WEBGL_PACK'));
\n\n** Whether we will use the im2col algorithm to speed up convolutions.
*\nENV.registerFlag('WEBGL_CONV_IM2COL', () => ENV.getBool('WEBGL_PACK'));
\n\n** The maximum texture dimension.
*\nENV.registerFlag(\n 'WEBGL_MAX_TEXTURE_SIZE',\n () =>
getWebGLMaxTextureSize(ENV.getNumber('WEBGL_VERSION')));
\n\n** The maximum texture dimension.
*\nENV.registerFlag(\n 'WEBGL_MAX_TEXTURES_IN_SHADER',\n () =>
getMaxTexturesInShader(ENV.getNumber('WEBGL_VERSION')));
\n\n**\n * The disjoint_query_timer extension version.\n * 0: disabled, 1: EXT_disjoint_timer_query, 2:\n * EXT_disjoint_timer_query_webgl2.\n * In Firefox with WebGL 2.0,\n * EXT_disjoint_timer_query_webgl2 is not available, so we must use the\n * WebGL 1.0 extension.\n *\nENV.registerFlag('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION', () => {\n
const webGLVersion = ENV.getNumber('WEBGL_VERSION');
\n\n if (webGLVersion === 0) {\n return 0;\n
}\n return getWebGLDisjointQueryTimerVersion(webGLVersion);
\n});
\n\n**\n * Whether the timer object from the disjoint_query_timer extension gives\n * timing information that is reliable.\n *\nENV.registerFlag(\n 'WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE',\n () =>
ENV.getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') > 0 &&\n
!device_util.isMobile());
\n\n**\n * Whether the device is physically capable of rendering to float32 textures.\n
*\nENV.registerFlag(\n 'WEBGL_RENDER_FLOAT32_CAPABLE',\n () =>
isCapableOfRenderingToFloatTexture(ENV.getNumber('WEBGL_VERSION')));
\n\n**\n * Whether rendering to float32 textures is enabled. If disabled, renders to\n * float16 textures.\n
*\nENV.registerFlag('WEBGL_RENDER_FLOAT32_ENABLED', () => {\n return
ENV.getBool('WEBGL_FORCE_F16_TEXTURES') ?\n false :\n
ENV.getBool('WEBGL_RENDER_FLOAT32_CAPABLE');
\n});
\n\n**\n * Whether downloading float textures is enabled (16 or 32 bit). If disabled,\n * uses IEEE 754 encoding of the float32 values to 4 uint8 when downloading.\n
*\nENV.registerFlag(\n 'WEBGL_DOWNLOAD_FLOAT_ENABLED',\n () =>
isDownloadFloatTextureEnabled(ENV.getNumber('WEBGL_VERSION')));
\n\n** Whether the fence API is available.
*\nENV.registerFlag(\n 'WEBGL_FENCE_API_ENABLED',\n () =>
isWebGLFenceEnabled(ENV.getNumber('WEBGL_VERSION')));
\n\n**\n * Tensors with size <= than this will be uploaded as uniforms, not textures.
*\nENV.registerFlag('WEBGL_SIZE_UPLOAD_UNIFORM', () => {\n //
Use uniform uploads only when 32bit floats are supported. In\n // 16bit\n // environments there are problems with comparing a 16bit texture value\n // with a 32bit uniform value.\n
const useUniforms =
ENV.getBool('WEBGL_RENDER_FLOAT32_ENABLED');
\n return useUniforms ? 4 : 0;
\n});
\n\n**\n * If the total number of bytes allocated on the GPU is greater than this\n * number, we will aggressively delete textures upon disposal with\n * gl.deleteMatrixTexture, rather than making them available for reuse.\n
*\n * Default value -1 indicates that we will never aggressively delete textures.
*\nENV.registerFlag(\n 'WEBGL_DELETE_TEXTURE_THRESHOLD',\n () => {\n return -1;\n
},\n threshold => {\n if
(threshold < 0 && threshold !== -1) {\n
throw new Error(\n
`WEBGL_DELETE_TEXTURE_THRESHOLD must be -1 (indicating never` +\n
`delete) or at least 0, but got ${threshold}.`);
\n
}\n
});
\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n
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*\n * you may not use this file except in compliance with the License.\n
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http://www.apache.org/licenses/LICENSE-2.0\n
*\n * Unless required by applicable law or agreed to in writing, software\n
*\n * distributed under the License is distributed on an "AS IS" BASIS,\n
*\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
*\n * See the License for the specific language governing permissions and\n
*\n * limitations under the License.\n
*\n

```

```

=====
*\nimport {env} from '@tensorflow/tfjs-core';\n\nexport type GLSL = {\n  version: string,\n  attribute: string,\n  varyingVs: string,\n  varyingFs: string,\n  texture2D: string,\n  output: string,\n  defineOutput: string,\n  defineSpecialNaN: string,\n  defineSpecialInf: string,\n  defineRound: string\n};\n\nexport function\ngetGlsDifferences(): GLSL {\n  let version: string;\n  let attribute: string;\n  let varyingVs: string;\n  let varyingFs:\nstring;\n  let texture2D: string;\n  let output: string;\n  let defineOutput: string;\n  let defineSpecialNaN: string;\n  let defineSpecialInf: string;\n  let defineRound: string;\n\n  if (env().getNumber('WEBGL_VERSION') === 2) {\n    version = '#version 300 es';\n    attribute = 'in';\n    varyingVs = 'out';\n    varyingFs = 'in';\n    texture2D = 'texture';\n    output = 'outputColor';\n    defineOutput = 'out vec4 outputColor';\n\n    // Use custom isnan definition to work\n    across differences between\n    // implementations on various platforms. While this should happen in ANGLE\n    // we still see differences between android and windows (on chrome) when\n    // using isnan directly.\n    defineSpecialNaN = `\n    bool isnan_custom(float val) {\n      return (val > 0.0 || val < 0.0) ? false : val != 0.0;\n    }\n\n    bvec4 isnan_custom(vec4 val) {\n      return bvec4(isnan_custom(val.x),\n        isnan_custom(val.y),\n        isnan_custom(val.z), isnan_custom(val.w));\n    }\n\n    #define isnan(value) isnan_custom(value)\n  `;\n    // In\n    webgl 2 we do not need to specify a custom isinf so there is no\n    // need for a special INFINITY constant.\n    defineSpecialInf = `;\n    defineRound = `\n    #define round(value) newRound(value)\n    int newRound(float\nvalue)\n    return int(floor(value + 0.5));\n  `;\n\n    ivec4 newRound(vec4 value) {\n      return\n      ivec4(floor(value + vec4(0.5)));\n    }\n  `;\n  } else {\n    version = ";\n    attribute = 'attribute';\n    varyingVs =\n'varying';\n    varyingFs = 'varying';\n    texture2D = 'texture2D';\n    output = 'gl_FragColor';\n    defineOutput = ";\n\n    // WebGL1 has no built in isnan so we define one here.\n    defineSpecialNaN = `\n    #define isnan(value)\n    isnan_custom(value)\n    bool isnan_custom(float val) {\n      return (val > 0. || val < 1. || val == 0.) ? false : true;\n    }\n\n    bvec4 isnan_custom(vec4 val) {\n      return bvec4(isnan(val.x), isnan(val.y), isnan(val.z),\n        isnan(val.w));\n    }\n  `;\n    defineSpecialInf = `\n    uniform float INFINITY;\n\n    bool isinf(float val) {\n      return abs(val) == INFINITY;\n    }\n\n    bvec4 isinf(vec4 val) {\n      return equal(abs(val), vec4(INFINITY));\n    }\n  `;\n    defineRound = `\n    int round(float value) {\n      return int(floor(value + 0.5));\n    }\n\n    ivec4\nround(vec4 value) {\n      return ivec4(floor(value + vec4(0.5)));\n    }\n  `;\n  }\n\n  return {\n    version,\n    attribute,\n    varyingVs,\n    varyingFs,\n    texture2D,\n    output,\n    defineOutput,\n    defineSpecialNaN,\n    defineSpecialInf,\n    defineRound\n  };\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
  

=====
*\nimport {util} from '@tensorflow/tfjs-core';\n\n/**\n * Produces GLSL code that derives logical coordinates\n from a flat\n * index. The code performs integer division with each stride and decrements\n * the index until the\n index equals the final dimension coordinate.\n */\nexport function getLogicalCoordinatesFromFlatIndex(\n  coords: string[], shape: number[], index = 'index'): string {\n  const strides = util.computeStrides(shape);\n  return\n  strides\n    .map((stride, i) => {\n      const line1 = `int ${coords[i]} = ${index} / ${stride}`;\n      const line2 = i\n      ===\n      strides.length - 1 ?\n        `int ${coords[i + 1]} = ${index} - ${coords[i]} * ${stride}`\n        :\n        `index -=\n        ${coords[i]} * ${stride}`;\n      return `${line1}; ${line2}`;\n    })\n    .join(");\n\n  }\n\n  function buildVec(x:\nstring[]): string {\n    if (x.length === 1) {\n      return `${x[0]}`;\n    }\n    return\n    `vec${x.length}(${x.join(',')}`;\n  }\n\n  /**\n * Produces GLSL code that computes the dot product of the input x and\n y\n * vectors. Handles splitting inputs into increments of vec4s when necessary.\n */\nexport function dotify(x:\nstring[], y: string[]): string {\n  if (x.length !== y.length) {\n    throw new Error(\n      `Vectors to be dotted must be\n      of the same length - ^ +\n      `got ${x.length} and ${y.length}`);\n  }\n\n  const slices: string[] = [];\n  const\n  nearestVec4 = Math.floor(x.length / 4);\n  const nearestVec4Remainder = x.length % 4;\n\n  for (let i = 0; i <

```



```

userCode: string;\n packedInputs = true;\n packedOutput = true;\n outputShape: [number, number, number];\n
outPackingScheme = PackingScheme.DENSE;\n\n constructor(outputShape: [number, number, number]) {\n
const texShape = getDenseTexShape(outputShape);\n const glsl = getGlslDifferences();\n this.outputShape =
outputShape;\n\n this.userCode = `\n ivec3 outCoordsFromFlatIndex(int index) {\n    ${\n
shader_util.getLogicalCoordinatesFromFlatIndex(\n      [r', 'c', 'd'], outputShape)}\n    return ivec3(r, c, d);\n
  }\n\n  void main() {\n    ivec2 resTexRC = ivec2(resultUV.yx * \n      vec2(${texShape[0]},
${texShape[1]}));\n    int index = 4 * (resTexRC.x * ${texShape[1]} + resTexRC.y);\n    vec4 result =
vec4(0.);\n    for (int i=0; i<4; i++) {\n      int flatIndex = index + i;\n      ivec3 rc =
outCoordsFromFlatIndex(flatIndex);\n      result[i] = getChannel(getA(rc.x, rc.y, rc.z), vec2(rc.y, rc.z));\n
  }\n\n    ${glsl.output} = result;\n  }\n  `;\n }\n }\n\n", "/**\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport
{ENCODE_FLOAT_SNIPPET} from './shader_compiler_util';\nimport {TextureUsage} from './tex_util';\n\nexport
class EncodeFloatProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  userCode: string;\n
outputShape: number[];\n  outTexUsage = TextureUsage.DOWNLOAD;\n\n  constructor(outputShape: number[])
{\n    const glsl = getGlslDifferences();\n    this.outputShape = outputShape;\n    this.userCode = `\n
${ENCODE_FLOAT_SNIPPET}\n\n    void main() {\n      float x = getAAtOutCoords();\n      ${glsl.output} =
encode_float(x);\n    }\n  `;\n }\n }\n\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport
{ENCODE_FLOAT_SNIPPET} from './shader_compiler_util';\nimport {TextureUsage} from './tex_util';\n\nexport
class EncodeFloatPackedProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  userCode: string;\n
outputShape: number[];\n  packedInputs = true;\n  packedOutput = false;\n  outTexUsage =
TextureUsage.DOWNLOAD;\n\n  constructor(outputShape: [number, number, number]) {\n    const glsl =
getGlslDifferences();\n    this.outputShape = outputShape;\n    this.userCode = `\n
${ENCODE_FLOAT_SNIPPET}\n\n    void main() {\n      ivec3 coords = getOutputCoords();\n      float x =
getChannel(getAAtOutCoords(), vec2(coords.y, coords.z));\n      ${glsl.output} = encode_float(x);\n    }\n  `;\n }\n }\n\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport *
as shader_util from './shader_compiler_util';\n\nexport class EncodeMatrixProgram implements GPGPUProgram {\n

```

```

variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n\n constructor(\n   outputShape: [number,
number, number], texShape: [number, number],\n   inputIsUnsignedByte = false) {\n   const glsl =
getGlslDifferences();\n   const [height, width] = texShape;\n   this.outputShape = outputShape;\n\n   let output =
`result`;\n   if (inputIsUnsignedByte) {\n     output = `floor(result * 255. + 0.5)`;\n   }\n\n   this.userCode = `\n
${shader_util.getFlatIndexFrom3D(outputShape)}\n\n   void main() {\n     ivec3 coords =
getOutputCoords();\n\n     int flatIndex = getFlatIndex(coords);\n     int offset = imod(flatIndex, 4);\n\n
flatIndex = idiv(flatIndex, 4, 1.);\n\n     int r = flatIndex / ${width};\n     int c = imod(flatIndex, ${width});\n
vec2 uv = (vec2(c, r) + halfCR) / vec2(${width}.0, ${height}.0);\n     vec4 values = ${glsl.texture2D}(A, uv);\n\n
float result;\n\n     if(offset == 0) {\n       result = values[0];\n     } else if(offset == 1) {\n       result =
values[1];\n     } else if(offset == 2) {\n       result = values[2];\n     } else {\n       result = values[3];\n
}\n\n     ${glsl.output} = vec4(${output}, 0., 0., 0.); \n     `;\n   }\n}\n\n", "/*\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport *
as shader_util from './shader_compiler_util';\n\n/*\n\nThis is how the shader encodes a tensor with shape = [2, 3,
5]\n\n(indices are [batch, row, col]).\n\n000|001 002|003 004|xxx 020|021 022|023 024|xxx\n-----
----- ----
--- ----- ----- -----\n010|011 012|013 014|xxx xxx|xxx xxx|xxx xxx|xxx\n\n100|101 102|103 104|xxx
120|121 122|123 124|xxx\n----- ----- ----- ----- -----\n\n110|111 112|113 114|xxx xxx|xxx
xxx|xxx\n\nSingle texels contain only values from the same batch, and from adjacent rows\nand
columns.\n */\n\nexport class EncodeMatrixPackedProgram implements GPGPUProgram {\n   variableNames =
['A'];\n   userCode: string;\n   outputShape: number[];\n   packedInputs = false;\n   packedOutput = true;\n\n   constructor(\n     outputShape: [number, number, number], texShape: [number, number],\n     inputIsUnsignedByte
= false) {\n     const glsl = getGlslDifferences();\n     const [height, width] = texShape;\n     this.outputShape =
outputShape;\n\n     let mainLoop = ";\n     let output = 'result';\n     if (inputIsUnsignedByte) {\n       output =
'floor(result * 255. + 0.5)';\n     }\n\n     for (let row = 0; row <= 1; row++) {\n       for (let col = 0; col <= 1; col++) {\n
\n         const channel = row * 2 + col;\n\n         mainLoop += `\n         localCoords = coords;\n         if(localCoords[2] +
${col} < ${outputShape[2]}) {\n           localCoords[2] += ${col};\n           if(localCoords[1] + ${row} <
${outputShape[1]}) {\n             localCoords[1] += ${row};\n\n             flatIndex = getFlatIndex(localCoords);\n
\n             offset = imod(flatIndex, 4);\n\n             flatIndex = idiv(flatIndex, 4, 1.); \n             r = flatIndex / ${width};\n
\n             c = imod(flatIndex, ${width});\n             uv = (vec2(c, r) + halfCR) / vec2(${width}.0, ${height}.0);\n
\n             values = ${glsl.texture2D}(A, uv);\n\n             if(offset == 0) {\n               result[${channel}] = values[0];\n
\n             } else if(offset == 1) {\n               result[${channel}] = values[1];\n             } else if(offset == 2) {\n
\n               result[${channel}] = values[2];\n             } else {\n               result[${channel}] = values[3];\n             }\n
\n             `;\n           }\n         }\n\n         this.userCode = `\n         ${shader_util.getFlatIndexFrom3D(outputShape)}\n\n
         void main() {\n           ivec3 coords = getOutputCoords();\n           vec4 result = vec4(0.); \n           int flatIndex, r, c,
offset;\n           ivec3 localCoords;\n           vec2 uv;\n           vec4 values;\n\n           ${mainLoop}\n\n           ${glsl.output} =
${output};\n         `;\n       }\n     }\n\n     `;\n   }\n}\n\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n

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=====\\n
*\\n\\nimport {PixelData, TypedArray} from '@tensorflow/tfjs-core';\\n\\nimport {getGlsIDifferences} from
'./glsl_version';\\nimport * as tex_util from './tex_util';\\nimport {TextureConfig} from './tex_util';\\nimport * as
webgl_util from './webgl_util';\\n\\nexport function createVertexShader(gl: WebGLRenderingContext):
WebGLShader {\\n  const glsl = getGlsIDifferences();\\n  const vertexShaderSource = `${glsl.version}\\n  precision
highp float;\\n  ${glsl.attribute} vec3 clipSpacePos;\\n  ${glsl.attribute} vec2 uv;\\n  ${glsl.varyingVs} vec2
resultUV;\\n\\n  void main() {\\n    gl_Position = vec4(clipSpacePos, 1);\\n    resultUV = uv;\\n  }`;\\n  return
webgl_util.createVertexShader(gl, vertexShaderSource);\\n}\\n\\nexport function createVertexBuffer(gl:
WebGLRenderingContext): WebGLBuffer {\\n  // [x y z u v] * [upper-left, lower-left, upper-right, lower-right]\\n
const vertexArray = new Float32Array(\\n    [-1, 1, 0, 0, 1, -1, -1, 0, 0, 0, 1, 1, 0, 1, 1, -1, 0, 1, 0]);\\n  return
webgl_util.createStaticVertexBuffer(gl, vertexArray);\\n}\\n\\nexport function createIndexBuffer(gl:
WebGLRenderingContext): WebGLBuffer {\\n  // OpenGL (and WebGL) have "CCW == front" winding\\n  const
triangleVertexIndices = new Uint16Array([0, 1, 2, 2, 1, 3]);\\n  return webgl_util.createStaticIndexBuffer(gl,
triangleVertexIndices);\\n}\\n}\\nfunction createAndConfigureTexture(\\n  gl: WebGLRenderingContext, width:
number, height: number,\\n  internalFormat: number, textureFormat: number,\\n  textureType: number):
WebGLTexture {\\n  webgl_util.validateTextureSize(width, height);\\n  const texture =
webgl_util.createTexture(gl);\\n\\n  const tex2d = gl.TEXTURE_2D;\\n  webgl_util.callAndCheck(gl, () =>
gl.bindTexture(tex2d, texture));\\n  webgl_util.callAndCheck(\\n    gl, () => gl.texParameteri(tex2d,
gl.TEXTURE_WRAP_S, gl.CLAMP_TO_EDGE));\\n  webgl_util.callAndCheck(\\n    gl, () =>
gl.texParameteri(tex2d, gl.TEXTURE_WRAP_T, gl.CLAMP_TO_EDGE));\\n  webgl_util.callAndCheck(\\n    gl, ()
=> gl.texParameteri(tex2d, gl.TEXTURE_MIN_FILTER, gl.NEAREST));\\n  webgl_util.callAndCheck(\\n    gl, ()
=> gl.texParameteri(tex2d, gl.TEXTURE_MAG_FILTER, gl.NEAREST));\\n  webgl_util.callAndCheck(\\n    gl,\\n
    () => gl.texImage2D(\\n      tex2d, 0, internalFormat, width, height, 0, textureFormat,\\n      textureType,
null));\\n  webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\\n  return
texture;\\n}\\n}\\nexport function getInternalFormatForFloat32MatrixTexture(\\n  textureConfig: TextureConfig) {\\n
return textureConfig.internalFormatFloat;\\n}\\n}\\nexport function createFloat32MatrixTexture(\\n  gl:
WebGLRenderingContext, rows: number, columns: number,\\n  textureConfig: TextureConfig): WebGLTexture {\\n
const [width, height] =\\n  tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\\n  return
createAndConfigureTexture(\\n    gl, width, height,\\n
getInternalFormatForFloat32MatrixTexture(textureConfig),\\n    textureConfig.textureFormatFloat,
gl.FLOAT);\\n}\\n}\\nexport function getInternalFormatForFloat16MatrixTexture(\\n  textureConfig: TextureConfig)
{\\n  return textureConfig.internalFormatHalfFloat;\\n}\\n}\\nexport function createFloat16MatrixTexture(\\n  gl:
WebGLRenderingContext, rows: number, columns: number,\\n  textureConfig: TextureConfig): WebGLTexture {\\n
const [width, height] =\\n  tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\\n  return
createAndConfigureTexture(\\n    gl, width, height,\\n
getInternalFormatForFloat16MatrixTexture(textureConfig),\\n    textureConfig.textureFormatFloat,
textureConfig.textureTypeHalfFloat);\\n}\\n}\\nexport function getInternalFormatForUnsignedBytesMatrixTexture(\\n
textureConfig: TextureConfig) {\\n  return textureConfig.downloadTextureFormat;\\n}\\n}\\nexport function
createUnsignedBytesMatrixTexture(\\n  gl: WebGLRenderingContext, rows: number, columns: number,\\n
textureConfig: TextureConfig): WebGLTexture {\\n  const [width, height] =\\n
tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\\n  return createAndConfigureTexture(\\n
gl, width, height,\\n  getInternalFormatForUnsignedBytesMatrixTexture(textureConfig), gl.RGBA,\\n
gl.UNSIGNED_BYTE);\\n}\\n}\\nexport function getInternalFormatForPackedMatrixTexture(\\n  textureConfig:
TextureConfig) {\\n  return textureConfig.internalFormatPackedFloat;\\n}\\n}\\nexport function
createPackedMatrixTexture(\\n  gl: WebGLRenderingContext, rows: number, columns: number,\\n  textureConfig:
TextureConfig): WebGLTexture {\\n  const [width, height] =\\n
tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\\n  return createAndConfigureTexture(\\n    gl,
width, height, getInternalFormatForPackedMatrixTexture(textureConfig),\\n    gl.RGBA, gl.FLOAT);\\n}\\n}\\nexport

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function getInternalFormatForFloat16PackedMatrixTexture(\n  textureConfig: TextureConfig) {\n return
textureConfig.internalFormatPackedHalfFloat;\n}\n\nexport function createFloat16PackedMatrixTexture(\n  gl:
WebGLRenderingContext, rows: number, columns: number,\n  textureConfig: TextureConfig): WebGLTexture {\n
const [width, height] =\n  tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\n return
createAndConfigureTexture(\n  gl, width, height,\n
getInternalFormatForFloat16PackedMatrixTexture(textureConfig), gl.RGBA,\n
textureConfig.textureTypeHalfFloat);\n}\n\nexport function bindVertexProgramAttributeStreams(\n  gl:
WebGLRenderingContext, program: WebGLProgram,\n  vertexBuffer: WebGLBuffer): boolean {\n const
posOffset = 0;          // x is the first buffer element\n const uvOffset = 3 * 4;          // uv comes after [x y z]\n
const stride = (3 * 4) + (2 * 4); // xyz + uv, each entry is 4-byte float.\n webgl_util.callAndCheck(\n  gl, () =>
gl.bindBuffer(gl.ARRAY_BUFFER, vertexBuffer));\n const success =
webgl_util.bindVertexBufferToProgramAttribute(\n  gl, program, 'clipSpacePos', vertexBuffer, 3, stride,
posOffset);\n return success &&\n  webgl_util.bindVertexBufferToProgramAttribute(\n  gl, program, 'uv',
vertexBuffer, 2, stride, uvOffset);\n}\n\nexport function uploadDenseMatrixToTexture(\n  gl:
WebGLRenderingContext, texture: WebGLTexture, width: number,\n  height: number, data: TypedArray,
textureConfig: TextureConfig) {\n webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D,
texture));\n let dataForUpload: TypedArray, texelDataType: number, internalFormat: number;\n if (data
instanceof Uint8Array) {\n  dataForUpload = new Uint8Array(width * height * 4);\n  texelDataType =
gl.UNSIGNED_BYTE;\n  internalFormat = gl.RGBA;\n } else {\n  dataForUpload = new Float32Array(width *
height * 4);\n  texelDataType = gl.FLOAT;\n  internalFormat = textureConfig.internalFormatPackedFloat;\n
}\n\n  dataForUpload.set(data);\n\n  webgl_util.callAndCheck(\n  gl,\n  () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, internalFormat, width, height, 0, gl.RGBA,\n  texelDataType, dataForUpload));\n\n
webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\n}\n\nexport function
uploadPixelDataToTexture(\n  gl: WebGLRenderingContext, texture: WebGLTexture,\n  pixels:
PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n  HTMLVideoElement) {\n
webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, texture));\n if ((pixels as PixelData).data
instanceof Uint8Array) {\n  webgl_util.callAndCheck(\n  gl,\n  () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, gl.RGBA, pixels.width, pixels.height, 0, gl.RGBA,\n  gl.UNSIGNED_BYTE, (pixels as
PixelData).data));\n } else {\n  webgl_util.callAndCheck(\n  gl,\n  () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, gl.RGBA, gl.RGBA, gl.UNSIGNED_BYTE,\n  pixels as ImageData |
HTMLImageElement | HTMLCanvasElement |\n  HTMLVideoElement));\n }\n\n
webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\n}\n\nexport function
createBufferFromOutputTexture(\n  gl2: WebGL2RenderingContext, rows: number, columns: number,\n
textureConfig: TextureConfig): WebGLBuffer {\n // Create and bind the buffer.\n const buffer =
gl2.createBuffer();\n webgl_util.callAndCheck(\n  gl2, () => gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER,
buffer));\n\n // Initialize the buffer to the size of the texture in bytes.\n const bytesPerFloat = 4;\n const
valuesPerTexel = 4;\n const bufferSizeBytes = bytesPerFloat * valuesPerTexel * rows * columns;\n\n
webgl_util.callAndCheck(\n  gl2,\n  () => gl2.bufferData(\n  gl2.PIXEL_PACK_BUFFER,
bufferSizeBytes, gl2.STREAM_READ));\n\n // Enqueue a command on the GPU command queue to copy of
texture into the\n // buffer.\n webgl_util.callAndCheck(\n  gl2, () => gl2.readPixels(0, 0, columns, rows,
gl2.RGBA, gl2.FLOAT, 0));\n\n webgl_util.callAndCheck(\n  gl2, () =>
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null));\n\n return buffer;\n}\n\nexport function
downloadFloat32MatrixFromBuffer(\n  gl: WebGLRenderingContext, buffer: WebGLBuffer,\n  size: number):
Float32Array {\n const gl2 = gl as WebGL2RenderingContext;\n\n const downloadTarget = new
Float32Array(size);\n gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, buffer);\n
gl2.getBufferSubData(gl2.PIXEL_PACK_BUFFER, 0, downloadTarget);\n
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null);\n\n return downloadTarget;\n}\n\nexport function
downloadByteEncodedFloatMatrixFromOutputTexture(\n  gl: WebGLRenderingContext, rows: number, columns:

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number,\n textureConfig: TextureConfig) {\n const [w, h] =\n
tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n\n const numChannels = 4;\n const
downloadTarget = new Uint8Array(\n tex_util.getUnpackedArraySizeFromMatrixSize(rows * columns,
numChannels));\n\n webgl_util.callAndCheck(\n gl,\n () => gl.readPixels(\n 0, 0, w, h,
textureConfig.downloadTextureFormat, gl.UNSIGNED_BYTE,\n downloadTarget));\n\n // By wrapping the
buffer in a Float32Array, we use native browser IEEE 754\n // decoding of the 4 bytes that back each 32 bit float.\n
return new Float32Array(downloadTarget.buffer);\n}\n\nexport function downloadPackedMatrixFromBuffer(\n
gl: WebGLRenderingContext, buffer: WebGLBuffer, batch: number, rows: number,\n cols: number,
physicalRows: number, physicalCols: number,\n textureConfig: TextureConfig): Float32Array {\n const gl2 = gl
as WebGL2RenderingContext;\n\n const downloadTarget =\n new
Float32Array(tex_util.getPackedRGBAArraySizeFromMatrixShape(\n physicalRows, physicalCols));\n\n
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, buffer);\n gl2.getBufferSubData(gl2.PIXEL_PACK_BUFFER, 0,
downloadTarget);\n gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null);\n\n return downloadTarget;\n}\n\nexport
function downloadMatrixFromPackedOutputTexture(\n gl: WebGLRenderingContext, physicalRows: number,\n
physicalCols: number): Float32Array {\n const packedRGBA = new Float32Array(physicalRows * physicalCols *
4);\n webgl_util.callAndCheck(\n gl,\n () => gl.readPixels(\n 0, 0, physicalCols, physicalRows,
gl.RGBA, gl.FLOAT, packedRGBA));\n\n return packedRGBA;\n}\n\n"/**\n * @license\n * Copyright 2017
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {env, PixelData, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {getWebGLContext,
setWebGLContext} from './canvas_util';\n\nimport * as gpgpu_util from './gpgpu_util';\n\nimport * as tex_util from
 './tex_util';\n\nimport {TextureConfig} from './tex_util';\n\nimport {WebGL1DisjointQueryTimerExtension,
WebGL2DisjointQueryTimerExtension} from './webgl_types';\n\nimport * as webgl_util from
 './webgl_util';\n\nexport interface FenceContext {\n query: WebGLQuery|WebGLSync;\n isFencePassed():
boolean;\n}\n\nexport class GPGPUContext {\n gl: WebGLRenderingContext;\n textureFloatExtension: {};\n
textureHalfFloatExtension: {};\n colorBufferFloatExtension: {};\n colorBufferHalfFloatExtension: {};\n
disjointQueryTimerExtension: WebGL2DisjointQueryTimerExtension|\n
WebGL1DisjointQueryTimerExtension;\n vertexBuffer: WebGLBuffer;\n indexBuffer: WebGLBuffer;\n
framebuffer: WebGLFramebuffer;\n outputTexture: WebGLTexture|null = null;\n program: WebGLProgram|null =
null;\n private disposed = false;\n private disjoint: boolean;\n textureConfig: TextureConfig;\n\n constructor(gl?:
WebGLRenderingContext) {\n const glVersion = env().getNumber('WEBGL_VERSION');\n if (gl != null) {\n
this.gl = gl;\n setWebGLContext(glVersion, gl);\n } else {\n this.gl = getWebGLContext(glVersion);\n
}\n\n // WebGL 2.0 enables texture floats without an extension.\n let COLOR_BUFFER_FLOAT =
'WEBGL_color_buffer_float';\n const COLOR_BUFFER_HALF_FLOAT = 'EXT_color_buffer_half_float';\n if
(env().getNumber('WEBGL_VERSION') === 1) {\n const TEXTURE_FLOAT = 'OES_texture_float';\n
const TEXTURE_HALF_FLOAT = 'OES_texture_half_float';\n this.textureFloatExtension =\n
webgl_util.getExtensionOrThrow(this.gl, TEXTURE_FLOAT);\n if (webgl_util.hasExtension(this.gl,
TEXTURE_HALF_FLOAT)) {\n this.textureHalfFloatExtension =\n
webgl_util.getExtensionOrThrow(this.gl, TEXTURE_HALF_FLOAT);\n } else if
(env().get('WEBGL_FORCE_F16_TEXTURES')) {\n throw new Error(\n 'GL context does not support
half float textures, yet the ' +\n 'environment flag WEBGL_FORCE_F16_TEXTURES is set to true.);\n
}\n\n this.colorBufferFloatExtension = this.gl.getExtension(COLOR_BUFFER_FLOAT);\n if
(webgl_util.hasExtension(this.gl, COLOR_BUFFER_HALF_FLOAT)) {\n this.colorBufferHalfFloatExtension

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=\\n      WebGLUtil.getExtensionOrThrow(this.gl, COLOR_BUFFER_HALF_FLOAT);\\n    } else if
(env().get('WEBGL_FORCE_F16_TEXTURES')) {\\n      throw new Error(\\n        'GL context does not support
color renderable half floats, yet ' +\\n        'the environment flag WEBGL_FORCE_F16_TEXTURES is set to
true.');"\\n    } else {\\n      COLOR_BUFFER_FLOAT = 'EXT_color_buffer_float';\\n      if
(WebGLUtil.hasExtension(this.gl, COLOR_BUFFER_FLOAT)) {\\n        this.colorBufferFloatExtension =\\n
this.gl.getExtension(COLOR_BUFFER_FLOAT);\\n      } else if (WebGLUtil.hasExtension(this.gl,
COLOR_BUFFER_HALF_FLOAT)) {\\n        this.colorBufferHalfFloatExtension =\\n
this.gl.getExtension(COLOR_BUFFER_HALF_FLOAT);\\n      } else {\\n        throw new Error('GL context does not
support color renderable floats');\\n      }\\n    }\\n    this.vertexBuffer = gpgpu_util.createVertexBuffer(this.gl);\\n
this.indexBuffer = gpgpu_util.createIndexBuffer(this.gl);\\n    this.framebuffer =
WebGLUtil.createFramebuffer(this.gl);\\n    this.textureConfig =\\n      tex_util.getTextureConfig(this.gl,
this.textureHalfFloatExtension);\\n  }\\n  private get debug(): boolean {\\n    return env().getBool('DEBUG');\\n  }\\n  public dispose() {\\n    if (this.disposed) {\\n      return;\\n    }\\n    if (this.program != null) {\\n      console.warn(\\n
'Disposing a GPGPUContext that still has a bound WebGLProgram.' +\\n      ' This is probably a resource leak,
delete the program with ' +\\n      'GPGPUContext.deleteProgram before disposing.');"\\n    }\\n    if
(this.outputTexture != null) {\\n      console.warn(\\n        'Disposing a GPGPUContext that still has a bound output
matrix ' +\\n        'texture. This is probably a resource leak, delete the output ' +\\n        'matrix texture with
GPGPUContext.deleteMatrixTexture before ' +\\n        'disposing.');"\\n    }\\n    const gl = this.gl;\\n
WebGLUtil.callAndCheck(gl, () => gl.finish());\\n    WebGLUtil.callAndCheck(gl, () =>
gl.bindFramebuffer(gl.FRAMEBUFFER, null));\\n    WebGLUtil.callAndCheck(gl, () =>
gl.deleteFramebuffer(this.framebuffer));\\n    WebGLUtil.callAndCheck(gl, () =>
gl.bindBuffer(gl.ARRAY_BUFFER, null));\\n    WebGLUtil.callAndCheck(\\n      gl, () =>
gl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER, null));\\n    WebGLUtil.callAndCheck(gl, () =>
gl.deleteBuffer(this.indexBuffer));\\n    this.disposed = true;\\n  }\\n  public createFloat32MatrixTexture(rows:
number, columns: number):\\n    WebGLTexture {\\n      this.throwIfDisposed();\\n      return
gpgpu_util.createFloat32MatrixTexture(\\n        this.gl, rows, columns, this.textureConfig);\\n    }\\n  public
createFloat16MatrixTexture(rows: number, columns: number):\\n    WebGLTexture {\\n      this.throwIfDisposed();\\n
      return gpgpu_util.createFloat16MatrixTexture(\\n        this.gl, rows, columns, this.textureConfig);\\n    }\\n  public
createUnsignedBytesMatrixTexture(rows: number, columns: number):\\n    WebGLTexture {\\n
      this.throwIfDisposed();\\n      return gpgpu_util.createUnsignedBytesMatrixTexture(\\n        this.gl, rows, columns,
this.textureConfig);\\n    }\\n  public uploadPixelDataToTexture(\\n    texture: WebGLTexture,\\n    pixels:
ImageData|ImageData|HTMLImageElement|HTMLCanvasElement) {\\n      this.throwIfDisposed();\\n
      gpgpu_util.uploadPixelDataToTexture(this.gl, texture, pixels);\\n    }\\n  public uploadDenseMatrixToTexture(\\n
    texture: WebGLTexture, width: number, height: number, data: TypedArray) {\\n      this.throwIfDisposed();\\n
      gpgpu_util.uploadDenseMatrixToTexture(\\n        this.gl, texture, width, height, data, this.textureConfig);\\n    }\\n  public
createFloat16PackedMatrixTexture(rows: number, columns: number):\\n    WebGLTexture {\\n
      this.throwIfDisposed();\\n      return gpgpu_util.createFloat16PackedMatrixTexture(\\n        this.gl, rows, columns,
this.textureConfig);\\n    }\\n  public createPackedMatrixTexture(rows: number, columns: number):\\n
    WebGLTexture {\\n      this.throwIfDisposed();\\n      return gpgpu_util.createPackedMatrixTexture(\\n        this.gl, rows,
columns, this.textureConfig);\\n    }\\n  public deleteMatrixTexture(texture: WebGLTexture) {\\n
      this.throwIfDisposed();\\n      if (this.outputTexture === texture) {\\n
        WebGLUtil.unbindColorTextureFromFramebuffer(this.gl, this.framebuffer);\\n        this.outputTexture = null;\\n      }\\n
      WebGLUtil.callAndCheck(this.gl, () => this.gl.deleteTexture(texture));\\n    }\\n  public
downloadByteEncodedFloatMatrixFromOutputTexture(\\n    texture: WebGLTexture, rows: number, columns:
number): Float32Array {\\n      return this.downloadMatrixDriver(\\n        texture,\\n        () =>
gpgpu_util.downloadByteEncodedFloatMatrixFromOutputTexture(\\n          this.gl, rows, columns,
this.textureConfig));\\n    }\\n  public downloadPackedMatrixFromBuffer(\\n    buffer: WebGLBuffer, batch:
number, rows: number, columns: number,\\n    physicalRows: number, physicalCols: number): Float32Array {\\n

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return gpgpu_util.downloadPackedMatrixFromBuffer(\n      this.gl, buffer, batch, rows, columns, physicalRows,
physicalCols,\n      this.textureConfig);\n }\n\n public downloadFloat32MatrixFromBuffer(buffer: WebGLBuffer,
size: number):\n  Float32Array {\n  return gpgpu_util.downloadFloat32MatrixFromBuffer(this.gl, buffer,
size);\n }\n\n public createBufferFromTexture(\n  texture: WebGLTexture, rows: number, columns: number):
WebGLBuffer {\n  this.bindTextureToFramebuffer(texture);\n  const result =
gpgpu_util.createBufferFromOutputTexture(\n    this.gl as WebGL2RenderingContext, rows, columns,
this.textureConfig);\n  this.unbindTextureToFramebuffer();\n  return result;\n }\n\n public
createAndWaitForFence(): Promise<void> {\n  const fenceContext = this.createFence(this.gl);\n  return
this.pollFence(fenceContext);\n }\n\n private createFence(gl: WebGLRenderingContext): FenceContext {\n  let
query: WebGLQuery|WebGLSync;\n  let isFencePassed: () => boolean;\n\n  if
(env().getBool('WEBGL_FENCE_API_ENABLED')) {\n    const gl2 = gl as WebGL2RenderingContext;\n\n    const sync = gl2.fenceSync(gl2.SYNC_GPU_COMMANDS_COMPLETE, 0);\n    gl.flush();\n\n    isFencePassed = () => {\n      const status = gl2.clientWaitSync(sync, 0, 0);\n      return status ===
gl2.ALREADY_SIGNALED ||\n        status === gl2.CONDITION_SATISFIED;\n    };\n\n    query = sync;\n  } else if (\n    env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') > 0) {\n
query = this.beginQuery();\n    this.endQuery();\n    isFencePassed = () => this.isQueryAvailable(\n      query,\n      env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION'));\n  } else {\n    // If
we have no way to fence, return true immediately. This will fire in\n    // WebGL 1.0 when there is no disjoint
query timer. In this case, because\n    // the fence passes immediately, we'll immediately ask for a download of\n
// the texture, which will cause the UI thread to hang.\n    isFencePassed = () => true;\n  }\n\n  return {query,
isFencePassed};\n }\n\n public downloadMatrixFromPackedTexture(\n  texture: WebGLTexture, physicalRows:
number,\n  physicalCols: number): Float32Array {\n  return this.downloadMatrixDriver(\n    texture,\n    ()
=> gpgpu_util.downloadMatrixFromPackedOutputTexture(\n      this.gl, physicalRows, physicalCols));\n }\n\n private
vertexAttrsAreBound = false;\n\n public createProgram(fragmentShaderSource: string): WebGLProgram
{\n  this.throwIfDisposed();\n  const gl = this.gl;\n  const fragmentShader: WebGLShader =\n  webgl_util.createFragmentShader(gl, fragmentShaderSource);\n  const vertexShader: WebGLShader =
gpgpu_util.createVertexShader(gl);\n  const program: WebGLProgram = webgl_util.createProgram(gl);\n
webgl_util.callAndCheck(gl, () => gl.attachShader(program, vertexShader));\n  webgl_util.callAndCheck(gl, () =>
gl.attachShader(program, fragmentShader));\n  webgl_util.linkProgram(gl, program);\n  if (this.debug) {\n
webgl_util.validateProgram(gl, program);\n  }\n  if (!this.vertexAttrsAreBound) {\n
this.setProgram(program);\n    this.vertexAttrsAreBound = gpgpu_util.bindVertexProgramAttributeStreams(\n
gl, this.program, this.vertexBuffer);\n  }\n  return program;\n }\n\n public deleteProgram(program:
WebGLProgram) {\n  this.throwIfDisposed();\n  if (program === this.program) {\n    this.program = null;\n
}\n  if (program != null) {\n    webgl_util.callAndCheck(this.gl, () => this.gl.deleteProgram(program));\n  }\n
}\n\n public setProgram(program: WebGLProgram|null) {\n  this.throwIfDisposed();\n  this.program =
program;\n  if ((this.program != null) && this.debug) {\n    webgl_util.validateProgram(this.gl, this.program);\n
}\n  webgl_util.callAndCheck(this.gl, () => this.gl.useProgram(program));\n }\n\n public getUniformLocation(\n
program: WebGLProgram, uniformName: string,\n  shouldThrow = true): WebGLUniformLocation {\n
this.throwIfDisposed();\n  if (shouldThrow) {\n    return webgl_util.getProgramUniformLocationOrThrow(\n
this.gl, program, uniformName);\n  } else {\n    return webgl_util.getProgramUniformLocation(\n      this.gl,
program, uniformName);\n  }\n }\n\n public getAttributeLocation(program: WebGLProgram, attribute: string):\n
number {\n  this.throwIfDisposed();\n  return webgl_util.callAndCheck(\n    this.gl, () =>
this.gl.getAttribLocation(program, attribute));\n }\n\n public getUniformLocationNoThrow(program:
WebGLProgram, uniformName: string):\n  WebGLUniformLocation {\n  this.throwIfDisposed();\n  return
this.gl.getUniformLocation(program, uniformName);\n }\n\n public setInputMatrixTexture(\n
inputMatrixTexture: WebGLTexture, uniformLocation: WebGLUniformLocation,\n  textureUnit: number) {\n
this.throwIfDisposed();\n  this.throwIfNoProgram();\n  webgl_util.bindTextureToProgramUniformSampler(\n
this.gl, inputMatrixTexture, uniformLocation, textureUnit);\n }\n\n public setOutputMatrixTexture(\n

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outputMatrixTexture: WebGLTexture, rows: number, columns: number) {\n
this.setOutputMatrixTextureDriver(outputMatrixTexture, columns, rows);\n }\n\n public
setOutputPackedMatrixTexture(\n   outputPackedMatrixTexture: WebGLTexture, rows: number, columns:
number) {\n   this.throwIfDisposed();\n   const [width, height] =\n   tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\n   this.setOutputMatrixTextureDriver(outputPackedMatrixTexture, width, height);\n }\n\n public
setOutputMatrixWriteRegion(\n   startRow: number, numRows: number, startColumn: number,\n   numColumns: number) {\n   this.setOutputMatrixWriteRegionDriver(\n     startColumn, startRow, numColumns,
numRows);\n }\n\n public setOutputPackedMatrixWriteRegion(\n   startRow: number, numRows: number,
startColumn: number,\n   numColumns: number) {\n   throw new Error('setOutputPackedMatrixWriteRegion not
implemented.);\n }\n\n public debugValidate() {\n   if (this.program != null) {\n
webgl_util.validateProgram(this.gl, this.program);\n   }\n   webgl_util.validateFramebuffer(this.gl);\n }\n\n public
executeProgram() {\n   this.throwIfDisposed();\n   this.throwIfNoProgram();\n   const gl = this.gl;\n   if
(this.debug) {\n     this.debugValidate();\n   }\n   webgl_util.callAndCheck(\n     gl, () =>
gl.drawElements(gl.TRIANGLES, 6, gl.UNSIGNED_SHORT, 0));\n }\n\n public
blockUntilAllProgramsCompleted() {\n   this.throwIfDisposed();\n   webgl_util.callAndCheck(this.gl, () =>
this.gl.finish());\n }\n\n private getQueryTimerExtension(): WebGL1DisjointQueryTimerExtension\n
|WebGL2DisjointQueryTimerExtension {\n   if (this.disjointQueryTimerExtension == null) {\n
this.disjointQueryTimerExtension =\n     webgl_util.getExtensionOrThrow(\n       this.gl,\n
env().getNumber(\n         'WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') === 2 ?\n
'EXT_disjoint_timer_query_webgl2' :\n         'EXT_disjoint_timer_query') as\n
WebGL1DisjointQueryTimerExtension | WebGL2DisjointQueryTimerExtension;\n   }\n   return
this.disjointQueryTimerExtension;\n }\n\n private getQueryTimerExtensionWebGL2():
WebGL2DisjointQueryTimerExtension {\n   return this.getQueryTimerExtension();\n }\n\n private
getQueryTimerExtensionWebGL1(): WebGL1DisjointQueryTimerExtension {\n   return
this.getQueryTimerExtension() as WebGL1DisjointQueryTimerExtension;\n }\n\n beginQuery(): WebGLQuery
{\n   if (env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') === 2) {\n     const
gl2 = this.gl as WebGL2RenderingContext;\n     const ext = this.getQueryTimerExtensionWebGL2();\n     const
query = gl2.createQuery();\n     gl2.beginQuery(ext.TIME_ELAPSED_EXT, query);\n     return query;\n   }\n
const ext = this.getQueryTimerExtensionWebGL1();\n   const query = ext.createQueryEXT() as WebGLQuery;\n
ext.beginQueryEXT(ext.TIME_ELAPSED_EXT, query);\n   return query;\n }\n\n endQuery() {\n   if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') === 2) {\n     const gl2 =
this.gl as WebGL2RenderingContext;\n     const ext = this.getQueryTimerExtensionWebGL2();\n
gl2.endQuery(ext.TIME_ELAPSED_EXT);\n     return;\n   }\n   const ext =
this.getQueryTimerExtensionWebGL1();\n   ext.endQueryEXT(ext.TIME_ELAPSED_EXT);\n }\n\n public async
waitForQueryAndGetTime(query: WebGLQuery): Promise<number> {\n   await util.repeatedTry(\n     () =>
this.disposed || // while testing contexts are created / disposed\n                               // in rapid succession, so without
this check we\n                               // may poll for the query timer indefinitely\n                               this.isQueryAvailable(\n
query,\n                               env().getNumber(\n
'WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION')));\n   return this.getQueryTime(\n     query,\n
env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION'));\n }\n\n private
getQueryTime(query: WebGLQuery, queryTimerVersion: number): number {\n   if (queryTimerVersion === 0) {\n
return null;\n   }\n\n   if (queryTimerVersion === 2) {\n     const gl2 = this.gl as WebGL2RenderingContext;\n
const timeElapsedNanos = gl2.getQueryParameter(query, gl2.QUERY_RESULT);\n     // Return milliseconds.\n
return timeElapsedNanos / 1000000;\n   } else {\n     const ext = this.getQueryTimerExtensionWebGL1();\n
const timeElapsedNanos =\n     ext.getQueryObjectEXT(query, ext.QUERY_RESULT_EXT);\n     // Return
milliseconds.\n     return timeElapsedNanos / 1000000;\n   }\n }\n\n private isQueryAvailable(query:
WebGLQuery, queryTimerVersion: number):\n boolean {\n   if (queryTimerVersion === 0) {\n     return true;\n
}

```



```

{getGlsIDifferences, GLSL} from './gls_l_version';\nimport * as shader_util from './shader_compiler_util';\n\nexport
type ShapeInfo = {\n  logicalShape: number[],\n  texShape: [number, number],\n  isUniform: boolean,\n  isPacked:
boolean,\n  flatOffset: number\n};\n\nexport type InputInfo = {\n  name: string,\n  shapeInfo:
ShapeInfo\n};\n\nexport function makeShader(\n  inputsInfo: InputInfo[], outputShape: ShapeInfo, userCode:
string,\n  usesPackedTextures: boolean): string {\n  const prefixSnippets: string[] = [];\n  inputsInfo.forEach(x =>
{\n    const size = util.sizeFromShape(x.shapeInfo.logicalShape);\n\n    // Snippet when we decided to upload the
values as uniform.\n    if (x.shapeInfo.isUniform) {\n      prefixSnippets.push(\n        `uniform float
${x.name}${size > 1 ? `[${size}]` : ``};`);\n    } else {\n      prefixSnippets.push(`uniform sampler2D
${x.name};`);\n      prefixSnippets.push(`uniform int offset${x.name};`);\n    }\n  });\n  const inputPrefixSnippet =
prefixSnippets.join("\\n");\n\n  const inputSamplingSnippet =\n    inputsInfo\n      .map(x =>
getInputSamplingSnippet(x, outputShape, usesPackedTextures))\n      .join("\\n");\n  const outTexShape =
outputShape.texShape;\n  const glsl = getGlsIDifferences();\n  const floatTextureSampleSnippet =
getFloatTextureSampleSnippet(glsl);\n  let outputSamplingSnippet: string;\n  let floatTextureSetOutputSnippet:
string;\n  let shaderPrefix = getShaderPrefix(glsl);\n\n  if (outputShape.isPacked) {\n    outputSamplingSnippet =\n      getPackedOutputSamplingSnippet(outputShape.logicalShape, outTexShape);\n    floatTextureSetOutputSnippet =
getFloatTextureSetRGBASnippet(glsl);\n  } else {\n    outputSamplingSnippet =\n      getOutputSamplingSnippet(outputShape.logicalShape, outTexShape);\n    floatTextureSetOutputSnippet =
getFloatTextureSetRSnippet(glsl);\n  }\n\n  if (usesPackedTextures) {\n    shaderPrefix +=
SHADER_PACKED_PREFIX;\n  }\n\n  const source = [\n    shaderPrefix, floatTextureSampleSnippet,\n    floatTextureSetOutputSnippet,\n    inputPrefixSnippet, outputSamplingSnippet, inputSamplingSnippet, userCode\n  ].join("\\n");\n  return source;\n}\n\nfunction getSamplerFromInInfo(inInfo: InputInfo): string {\n  const shape =
inInfo.shapeInfo.logicalShape;\n  switch (shape.length) {\n    case 0:\n      return getSamplerScalar(inInfo);\n    case
1:\n      return getSampler1D(inInfo);\n    case 2:\n      return getSampler2D(inInfo);\n    case 3:\n      return
getSampler3D(inInfo);\n    case 4:\n      return getSampler4D(inInfo);\n    case 5:\n      return
getSampler5D(inInfo);\n    case 6:\n      return getSampler6D(inInfo);\n    default:\n      throw new Error(\n
`${shape.length}-D input sampling` +\n        ` is not yet supported`);\n  }\n}\n\nfunction
getPackedSamplerFromInInfo(inInfo: InputInfo): string {\n  const shape = inInfo.shapeInfo.logicalShape;\n  switch
(shape.length) {\n    case 0:\n      return getPackedSamplerScalar(inInfo);\n    case 1:\n      return
getPackedSampler1D(inInfo);\n    case 2:\n      return getPackedSampler2D(inInfo);\n    case 3:\n      return
getPackedSampler3D(inInfo);\n    default:\n      return getPackedSamplerND(inInfo);\n  }\n}\n\nfunction
getInputSamplingSnippet(\n  inInfo: InputInfo, outShapeInfo: ShapeInfo,\n  usesPackedTextures = false): string
{\n  let res = `;\n  if (usesPackedTextures) {\n    res += getPackedSamplerFromInInfo(inInfo);\n  } else {\n    res +=
getSamplerFromInInfo(inInfo);\n  }\n\n  const inShape = inInfo.shapeInfo.logicalShape;\n  const outShape =
outShapeInfo.logicalShape;\n  if (inShape.length <= outShape.length) {\n    if (usesPackedTextures) {\n    res +=
getPackedSamplerAtOutputCoords(inInfo, outShapeInfo);\n  } else {\n    res +=
getSamplerAtOutputCoords(inInfo, outShapeInfo);\n  }\n  }\n  return res;\n}\n\nfunction
getPackedOutputSamplingSnippet(\n  outShape: number[], outTexShape: [number, number]): string {\n  switch
(outShape.length) {\n    case 0:\n      return getOutputScalarCoords();\n    case 1:\n      return
getOutputPacked1DCoords(outShape as [number], outTexShape);\n    case 2:\n      return
getOutputPacked2DCoords(outShape as [number, number], outTexShape);\n    case 3:\n      return
getOutputPacked3DCoords(\n      outShape as [number, number, number], outTexShape);\n    default:\n      return
getOutputPackedNDCoords(outShape, outTexShape);\n  }\n}\n\nfunction getOutputSamplingSnippet(\n
outShape: number[], outTexShape: [number, number]): string {\n  switch (outShape.length) {\n    case 0:\n      return
getOutputScalarCoords();\n    case 1:\n      return getOutput1DCoords(outShape as [number], outTexShape);\n    case
2:\n      return getOutput2DCoords(outShape as [number, number], outTexShape);\n    case 3:\n      return
getOutput3DCoords(\n      outShape as [number, number, number], outTexShape);\n    case 4:\n      return
getOutput4DCoords(\n      outShape as [number, number, number, number], outTexShape);\n    case 5:\n      return
getOutput5DCoords(\n      outShape as [number, number, number, number, number], outTexShape);\n    case 6:\n

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return getOutput6DCoords(\n      outShape as [number, number, number, number, number, number],\n
outTexShape);\n default:\n throw new Error(\n    `${outShape.length}-D output sampling is not yet
supported`);\n }\n}\n\nfunction getFloatTextureSampleSnippet(gsl: GLSL): string {\n return \n float
sampleTexture(sampler2D textureSampler, vec2 uv) {\n return ${gsl.texture2D}(textureSampler, uv).r;\n }\n
`;\n}\n\nfunction getFloatTextureSetRSnippet(gsl: GLSL): string {\n return \n void setOutput(float val) {\n
${gsl.output} = vec4(val, 0, 0, 0);\n }\n `;\n}\n\nfunction getFloatTextureSetRGBASnippet(gsl: GLSL): string
{\n return \n void setOutput(vec4 val) {\n ${gsl.output} = val;\n }\n `;\n}\n\nfunction getShaderPrefix(gsl:
GLSL): string {\n const SHADER_PREFIX = `${gsl.version}\n precision highp float;\n precision highp int;\n
precision highp sampler2D;\n ${gsl.varyingFs} vec2 resultUV;\n ${gsl.defineOutput}\n const vec2 halfCR =
vec2(0.5, 0.5);\n\n struct ivec5\n {\n int x;\n int y;\n int z;\n int w;\n int u;\n };\n\n struct
ivec6\n {\n int x;\n int y;\n int z;\n int w;\n int u;\n int v;\n };\n\n uniform float NAN;\n
${gsl.defineSpecialNaN}\n ${gsl.defineSpecialInf}\n ${gsl.defineRound}\n\n int imod(int x, int y) {\n
return x - y * (x / y);\n }\n\n int idiv(int a, int b, float sign) {\n int res = a / b;\n int mod = imod(a, b);\n
if (sign < 0. && mod != 0) {\n res -= 1;\n }\n return res;\n }\n\n //Based on the work of Dave
Hoskins\n //https://www.shadertoy.com/view/4djSRW\n #define HASHSCALE1 443.8975\n float
random(float seed){\n vec2 p = resultUV * seed;\n vec3 p3 = fract(vec3(p.xy) * HASHSCALE1);\n p3
+= dot(p3, p3.yzx + 19.19);\n return fract((p3.x + p3.y) * p3.z);\n }\n\n ${SAMPLE_1D_SNIPPET}\n
${SAMPLE_2D_SNIPPET}\n ${SAMPLE_3D_SNIPPET}\n `;\n\n return SHADER_PREFIX;\n}\n\nconst
SAMPLE_1D_SNIPPET = \nvec2 uvFromFlat(int texNumR, int texNumC, int index) {\n int texR = index /
texNumC;\n int texC = index - texR * texNumC;\n return (vec2(texC, texR) + halfCR) / vec2(texNumC,
texNumR);\n}\n\nvec2 packedUVfrom1D(int texNumR, int texNumC, int index) {\n int texelIndex = index / 2;\n int
texR = texelIndex / texNumC;\n int texC = texelIndex - texR * texNumC;\n return (vec2(texC, texR) + halfCR) /
vec2(texNumC, texNumR);\n}\n\nconst SAMPLE_2D_SNIPPET = \nvec2 packedUVfrom2D(int
texelsInLogicalRow, int texNumR, int texNumC, int row, int col) {\n int texelIndex = (row / 2) *
texelsInLogicalRow + (col / 2);\n int texR = texelIndex / texNumC;\n int texC = texelIndex - texR * texNumC;\n
return (vec2(texC, texR) + halfCR) / vec2(texNumC, texNumR);\n}\n\nconst SAMPLE_3D_SNIPPET = \nvec2
packedUVfrom3D(int texNumR, int texNumC, int texelsInBatch, int texelsInLogicalRow, int b, int row, int
col) {\n int index = b * texelsInBatch + (row / 2) * texelsInLogicalRow + (col / 2);\n int texR = index /
texNumC;\n int texC = index - texR * texNumC;\n return (vec2(texC, texR) + halfCR) / vec2(texNumC,
texNumR);\n}\n\nconst SHADER_PACKED_PREFIX = \n float getChannel(vec4 frag, vec2 innerDims) {\n
vec2 modCoord = mod(innerDims, 2.);\n return modCoord.x == 0. ? (modCoord.y == 0. ? frag.r : frag.g) :
(modCoord.y == 0. ? frag.b : frag.a);\n }\n float getChannel(vec4 frag, int dim) {\n float modCoord =
mod(float(dim), 2.);\n return modCoord == 0. ? frag.r : frag.g;\n }\n\nfunction getOutputScalarCoords() {\n
return \n int getOutputCoords() {\n return 0;\n }\n `;\n}\n\nfunction getOutputPacked1DCoords(\n shape:
[number], texShape: [number, number]): string {\n const packedTexShape = [\n [Math.ceil(texShape[0] / 2),
Math.ceil(texShape[1] / 2)];\n if (packedTexShape[0] === 1) {\n return \n int getOutputCoords() {\n
return 2 * int(resultUV.x * ${packedTexShape[1]}.0);\n }\n `;\n }\n\n if (packedTexShape[1] === 1) {\n
return \n int getOutputCoords() {\n return 2 * int(resultUV.y * ${packedTexShape[0]}.0);\n }\n `;\n
}\n\n return \n int getOutputCoords() {\n ivec2 resTexRC = ivec2(resultUV.yx * \n
vec2(${packedTexShape[0]}, ${packedTexShape[1]}));\n return 2 * (resTexRC.x * ${packedTexShape[1]} +
resTexRC.y);\n }\n `;\n}\n\nfunction getOutput1DCoords(\n shape: [number], texShape: [number, number]):
string {\n if (texShape[0] === 1) {\n return \n int getOutputCoords() {\n return int(resultUV.x *
${texShape[1]}.0);\n }\n `;\n }\n\n if (texShape[1] === 1) {\n return \n int getOutputCoords() {\n
return int(resultUV.y * ${texShape[0]}.0);\n }\n `;\n }\n\n return \n int getOutputCoords() {\n ivec2
resTexRC = ivec2(resultUV.yx * \n vec2(${texShape[0]}, ${texShape[1]}));\n return
resTexRC.x * ${texShape[1]} + resTexRC.y;\n }\n `;\n}\n\nfunction getOutputPacked3DCoords(\n shape:
[number, number, number], texShape: [number, number]): string {\n const packedTexShape = [\n
[Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n const texelsInLogicalRow = Math.ceil(shape[2] / 2);\n

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const texelsInBatch = texelsInLogicalRow * Math.ceil(shape[1] / 2);\n\n return \n ivec3 getOutputCoords() {\n
ivec2 resTexRC = ivec2(resultUV.yx *\n          vec2(${packedTexShape[0]},
${packedTexShape[1]}));\n  int index = resTexRC.x * ${packedTexShape[1]} + resTexRC.y;\n  int b =
index / ${texelsInBatch};\n  index -= b * ${texelsInBatch};\n\n  int r = 2 * (index / ${texelsInLogicalRow});\n
  int c = imod(index, ${texelsInLogicalRow}) * 2;\n\n  return ivec3(b, r, c);\n } \n `;\n\n\nfunction
getOutput3DCoords(\n  shape: [number, number, number], texShape: [number, number]): string {\n const
coordsFromIndexSnippet =\n  shader_util.getLogicalCoordinatesFromFlatIndex(['r', 'c', 'd'], shape);\n\n return \n
  ivec3 getOutputCoords() {\n  ivec2 resTexRC = ivec2(resultUV.yx *\n          vec2(${texShape[0]},
${texShape[1]}));\n  int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n
${coordsFromIndexSnippet}\n  return ivec3(r, c, d);\n } \n `;\n\n\nfunction getOutputPackedNDCoords(\n
shape: number[], texShape: [number, number]): string {\n const packedTexShape =\n  [Math.ceil(texShape[0] /
2), Math.ceil(texShape[1] / 2)];\n\n const texelsInLogicalRow = Math.ceil(shape[shape.length - 1] / 2);\n const
texelsInBatch =\n  texelsInLogicalRow * Math.ceil(shape[shape.length - 2] / 2);\n let texelsInBatchN =
texelsInBatch;\n let batches = ``;\n let coords = `b, r, c`;\n\n for (let b = 2; b < shape.length - 1; b++) {\n
texelsInBatchN *= shape[shape.length - b - 1];\n  batches = \n  int b${b} = index / ${texelsInBatchN};\n
index -= b${b} * ${texelsInBatchN};\n  ` + batches;\n  coords = `b${b}, ` + coords;\n } \n\n return \n
  ivec${shape.length} getOutputCoords() {\n  ivec2 resTexRC = ivec2(resultUV.yx *\n          vec2(${packedTexShape[0]}, ${packedTexShape[1]}));\n
  int index = resTexRC.x * ${packedTexShape[1]} +
resTexRC.y;\n\n  ${batches}\n\n  int b = index / ${texelsInBatch};\n  index -= b * ${texelsInBatch};\n\n
int r = 2 * (index / ${texelsInLogicalRow});\n  int c = imod(index, ${texelsInLogicalRow}) * 2;\n\n  return
  ivec${shape.length}(${coords});\n } \n `;\n\n\nfunction getOutput4DCoords(\n  shape: [number, number,
number, number],\n  texShape: [number, number]): string {\n const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n  ['r', 'c', 'd', 'd2'], shape);\n\n return \n  ivec4
getOutputCoords() {\n  ivec2 resTexRC = ivec2(resultUV.yx *\n          vec2(${texShape[0]}, ${texShape[1]}));\n
  int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n  ${coordsFromIndexSnippet}\n  return ivec4(r, c,
d, d2);\n } \n `;\n\n\nfunction getOutput5DCoords(\n  shape: [number, number, number, number, number],\n
texShape: [number, number]): string {\n const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n  ['r', 'c', 'd', 'd2', 'd3'], shape);\n\n return \n  ivec5
getOutputCoords() {\n  ivec2 resTexRC = ivec2(resultUV.yx * vec2(${texShape[0]},\n
${texShape[1]}));\n  int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n\n
${coordsFromIndexSnippet}\n\n  ivec5 outShape = ivec5(r, c, d, d2, d3);\n  return outShape;\n } \n
`;\n\n\nfunction getOutput6DCoords(\n  shape: [number, number, number, number, number, number],\n
texShape: [number, number]): string {\n const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n  ['r', 'c', 'd', 'd2', 'd3', 'd4'], shape);\n\n return \n
  ivec6
getOutputCoords() {\n  ivec2 resTexRC = ivec2(resultUV.yx *\n          vec2(${texShape[0]}, ${texShape[1]}));\n
  int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n\n  ${coordsFromIndexSnippet}\n\n  ivec6 result =
  ivec6(r, c, d, d2, d3, d4);\n  return result;\n } \n `;\n\n\nfunction getOutputPacked2DCoords(\n  shape:
[number, number], texShape: [number, number]): string {\n const packedTexShape =\n  [Math.ceil(texShape[0] /
2), Math.ceil(texShape[1] / 2)];\n\n if (util.arraysEqual(shape, texShape)) {\n  return \n  ivec2 getOutputCoords()
{\n  return 2 * ivec2(resultUV.yx * vec2(${packedTexShape[0]}, ${\n  packedTexShape[1]}));\n } \n
`;\n } \n\n // texels needed to accommodate a logical row\n const texelsInLogicalRow = Math.ceil(shape[1] / 2);\n\n
/**\n * getOutputCoords\n * \n * resTexRC: The rows and columns of the texels. If you move over one\n *
texel to the right in the packed texture, you are moving over one column\n * (not two).\n * \n * index: The texel
index\n */\n return \n  ivec2 getOutputCoords() {\n  ivec2 resTexRC = ivec2(resultUV.yx *\n          vec2(${packedTexShape[0]}, ${packedTexShape[1]}));\n
  int index = resTexRC.x * ${packedTexShape[1]} +
resTexRC.y;\n  int r = 2 * (index / ${texelsInLogicalRow});\n  int c = imod(index, ${texelsInLogicalRow}) *
2;\n\n  return ivec2(r, c);\n } \n `;\n\n\nfunction getOutput2DCoords(\n  shape: [number, number], texShape:
[number, number]): string {\n if (util.arraysEqual(shape, texShape)) {\n  return \n  ivec2 getOutputCoords() {\n

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return ivec2(resultUV.yx * vec2(${texShape[0]}, ${texShape[1]}));\n    }\n    }\n    if (shape[1] === 1) {\n
return \n    ivec2 getOutputCoords() {\n    ivec2 resTexRC = ivec2(resultUV.yx *\n
vec2(${texShape[0]}, ${texShape[1]}));\n    int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n
return ivec2(index, 0);\n    }\n    }\n    if (shape[0] === 1) {\n    return \n    ivec2 getOutputCoords() {\n
ivec2 resTexRC = ivec2(resultUV.yx *\n
vec2(${texShape[0]}, ${texShape[1]}));\n    int index\n
= resTexRC.x * ${texShape[1]} + resTexRC.y;\n    return ivec2(0, index);\n    }\n    }\n    }\n    return \n    ivec2\n
getOutputCoords() {\n    ivec2 resTexRC = ivec2(resultUV.yx *\n
vec2(${texShape[0]},\n
${texShape[1]}));\n    int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n    int r = index / ${shape[1]};\n
int c = index - r * ${shape[1]};\n    return ivec2(r, c);\n    }\n    }\n\nfunction\n
getFlatOffsetUniformName(texName: string): string {\n    return `offset${texName}`;\n}\n\nfunction\n
getPackedSamplerScalar(inputInfo: InputInfo): string {\n    const texName = inputInfo.name;\n    const funcName =\n
'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n    const glsl = getGlslDifferences();\n    return \n\n
vec4 ${funcName}() {\n    return ${glsl.texture2D}(${texName}, halfCR);\n    }\n    }\n\nfunction\n
getSamplerScalar(inputInfo: InputInfo): string {\n    const texName = inputInfo.name;\n    const funcName = 'get' +\n
texName.charAt(0).toUpperCase() + texName.slice(1);\n    if (inputInfo.shapeInfo.isUniform) {\n    return `float\n
${funcName}() {\n    return ${texName};\n    };\n    }\n    const [texNumR, texNumC] = inputInfo.shapeInfo.texShape;\n    if\n
(texNumR === 1 && texNumC === 1) {\n    return \n\n    float ${funcName}() {\n    return\n
sampleTexture(${texName}, halfCR);\n    }\n    }\n    }\n    const [tNumR, tNumC] =\n
inputInfo.shapeInfo.texShape;\n    const offset = getFlatOffsetUniformName(texName);\n    return \n\n    float\n
${funcName}() {\n    vec2 uv = uvFromFlat(${tNumR}, ${tNumC}, ${offset});\n    return\n
sampleTexture(${texName}, uv);\n    }\n    }\n    }\n\nfunction getPackedSampler1D(inputInfo: InputInfo): string {\n\n
const texName = inputInfo.name;\n    const funcName = 'get' + texName.charAt(0).toUpperCase() +\n
texName.slice(1);\n    const texShape = inputInfo.shapeInfo.texShape;\n    const packedTexShape =\n
[Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n    const glsl = getGlslDifferences();\n\n    return \n\n    vec4\n
${funcName}(int index) {\n    vec2 uv = packedUVfrom1D(\n    ${packedTexShape[0]},\n
${packedTexShape[1]}, index);\n    return ${glsl.texture2D}(${texName}, uv);\n    }\n    }\n    }\n\nfunction\n
getSampler1D(inputInfo: InputInfo): string {\n    const texName = inputInfo.name;\n    const funcName = 'get' +\n
texName.charAt(0).toUpperCase() + texName.slice(1);\n\n    if (inputInfo.shapeInfo.isUniform) {\n    // Uniform\n
arrays will be less than 65505 (no risk of float16 overflow).\n    return \n\n    float ${funcName}(int index) {\n\n
${getUniformSampler(inputInfo)}\n    }\n    }\n    }\n    const texShape = inputInfo.shapeInfo.texShape;\n    const\n
tNumR = texShape[0];\n    const tNumC = texShape[1];\n    if (tNumC === 1 && tNumR === 1) {\n    return \n\n    float\n
${funcName}(int index) {\n    return sampleTexture(${texName}, halfCR);\n    }\n    }\n    }\n    const offset\n
= getFlatOffsetUniformName(texName);\n    if (tNumC === 1) {\n    return \n\n    float ${funcName}(int index) {\n\n
vec2 uv = vec2(0.5, (float(index + ${offset}) + 0.5) / ${tNumR}.0);\n    return sampleTexture(${texName},\n
uv);\n    }\n    }\n    }\n    if (tNumR === 1) {\n    return \n\n    float ${funcName}(int index) {\n    vec2 uv =\n
vec2((float(index + ${offset}) + 0.5) / ${tNumC}.0, 0.5);\n    return sampleTexture(${texName}, uv);\n    }\n    }\n
}\n    }\n    return \n\n    float ${funcName}(int index) {\n    vec2 uv = uvFromFlat(${tNumR}, ${tNumC}, index +\n
${offset});\n    return sampleTexture(${texName}, uv);\n    }\n    }\n    }\n\nfunction getPackedSampler2D(inputInfo:\n
InputInfo): string {\n    const shape = inputInfo.shapeInfo.logicalShape;\n    const texName = inputInfo.name;\n    const\n
funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n    const texShape =\n
inputInfo.shapeInfo.texShape;\n\n    const texNumR = texShape[0];\n    const texNumC = texShape[1];\n    const glsl =\n
getGlslDifferences();\n    if (texShape != null && util.arraysEqual(shape, texShape)) {\n    return \n\n    vec4\n
${funcName}(int row, int col) {\n    vec2 uv = (vec2(col, row) + halfCR) / vec2(${texNumC}.0,\n
${texNumR}.0);\n\n    return ${glsl.texture2D}(${texName}, uv);\n    }\n    }\n    }\n    }\n    const packedTexShape\n
= [\n    Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n    const valuesPerRow = Math.ceil(shape[1] /\n
2);\n\n    return \n\n    vec4 ${funcName}(int row, int col) {\n    vec2 uv = packedUVfrom2D(${valuesPerRow},\n
${packedTexShape[0]}, ${\n    packedTexShape[1]}, row, col);\n    return ${glsl.texture2D}(${texName}, uv);\n\n
}\n    }\n    }\n\nfunction getSampler2D(inputInfo: InputInfo): string {\n    const shape =

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inputInfo.shapeInfo.logicalShape;\n const texName = inputInfo.name;\n const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n const texShape = inputInfo.shapeInfo.texShape;\n\n if
(texShape != null && util.arraysEqual(shape, texShape)) {\n const texNumR = texShape[0];\n const texNumC =
texShape[1];\n return \n float ${funcName}(int row, int col) {\n vec2 uv = (vec2(col, row) + halfCR) /
vec2(${texNumC}.0, ${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n }\n\n const
{newShape, keptDims} = util.squeezeShape(shape);\n const squeezedShape = newShape;\n if
(squeezedShape.length < shape.length) {\n const newInputInfo = squeezeInputInfo(inputInfo, squeezedShape);\n
const params = ['row', 'col'];\n return \n ${getSamplerFromInInfo(newInputInfo)}\n float ${funcName}(int
row, int col) {\n return ${funcName}(${getSqueezedParams(params, keptDims)});\n }\n }\n\n if
(inputInfo.shapeInfo.isUniform) {\n // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n
return \n float ${funcName}(int row, int col) {\n int index = round(dot(vec2(row, col), vec2(${shape[1]},
1)));\n ${getUniformSampler(inputInfo)}\n }\n }\n\n const texNumR = texShape[0];\n const
texNumC = texShape[1];\n const offset = getFlatOffsetUniformName(texName);\n if (texNumC === 1) {\n //
index is used directly as physical (no risk of float16 overflow).\n return \n float ${funcName}(int row, int col)
{\n float index = dot(vec3(row, col, ${offset}), vec3(${shape[1]}, 1, 1));\n vec2 uv = vec2(0.5, (index + 0.5) /
${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n }\n\n if (texNumR === 1) {\n // index
is used directly as physical (no risk of float16 overflow).\n return \n float ${funcName}(int row, int col) {\n
float index = dot(vec3(row, col, ${offset}), vec3(${shape[1]}, 1, 1));\n vec2 uv = vec2((index + 0.5) /
${texNumC}.0, 0.5);\n return sampleTexture(${texName}, uv);\n }\n }\n\n return \n float
${funcName}(int row, int col) {\n // Explicitly use integer operations as dot() only works on floats.\n int index =
row * ${shape[1]} + col + ${offset};\n vec2 uv = uvFromFlat(${texNumR}, ${texNumC}, index);\n return
sampleTexture(${texName}, uv);\n }\n }\n\nfunction getPackedSampler3D(inputInfo: InputInfo): string {\n
const shape = inputInfo.shapeInfo.logicalShape;\n const texName = inputInfo.name;\n const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n const texShape = inputInfo.shapeInfo.texShape;\n const
packedTexShape =\n [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n\n if (shape[0] === 1) {\n
const squeezedShape = shape.slice(1);\n const keptDims = [1, 2];\n const newInputInfo =
squeezeInputInfo(inputInfo, squeezedShape);\n const params = ['b', 'row', 'col'];\n return \n
${getPackedSamplerFromInInfo(newInputInfo)}\n vec4 ${funcName}(int b, int row, int col) {\n return
${funcName}(${getSqueezedParams(params, keptDims)});\n }\n }\n\n const texNumR =
packedTexShape[0];\n const texNumC = packedTexShape[1];\n const valuesPerRow = Math.ceil(shape[2] / 2);\n
const texelsInBatch = valuesPerRow * Math.ceil(shape[1] / 2);\n const glsl = getGlslDifferences();\n\n return \n
vec4 ${funcName}(int b, int row, int col) {\n vec2 uv = packedUVfrom3D(\n ${texNumR}, ${texNumC},
${texelsInBatch}, ${valuesPerRow}, b, row, col);\n return ${glsl.texture2D}(${texName}, uv);\n }\n
}\n\nfunction getSampler3D(inputInfo: InputInfo): string {\n const shape = inputInfo.shapeInfo.logicalShape;\n
const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() +
texName.slice(1);\n const stride0 = shape[1] * shape[2];\n const stride1 = shape[2];\n\n const {newShape,
keptDims} = util.squeezeShape(shape);\n const squeezedShape = newShape;\n if (squeezedShape.length <
shape.length) {\n const newInputInfo = squeezeInputInfo(inputInfo, squeezedShape);\n const params = ['row',
'col', 'depth'];\n return \n ${getSamplerFromInInfo(newInputInfo)}\n float ${funcName}(int row, int col,
int depth) {\n return ${funcName}(${getSqueezedParams(params, keptDims)});\n }\n }\n\n if
(inputInfo.shapeInfo.isUniform) {\n // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n
return \n float ${funcName}(int row, int col, int depth) {\n int index = round(dot(vec3(row, col, depth),\n
vec3(${stride0}, ${stride1}, 1)));\n ${getUniformSampler(inputInfo)}\n }\n }\n\n const
texShape = inputInfo.shapeInfo.texShape;\n const texNumR = texShape[0];\n const texNumC = texShape[1];\n
const flatOffset = inputInfo.shapeInfo.flatOffset;\n if (texNumC === stride0 && flatOffset == null) {\n // texC is
used directly as physical (no risk of float16 overflow).\n return \n float ${funcName}(int row, int col, int
depth) {\n float texR = float(row);\n float texC = dot(vec2(col, depth), vec2(${stride1}, 1));\n vec2
uv = (vec2(texC, texR) + halfCR) /\n vec2(${texNumC}.0, ${texNumR}.0);\n return

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sampleTexture(${texName}, uv);\n    }\n    `;\n }\n\n if (texNumC === stride1 && flatOffset == null) {\n //
texR is used directly as physical (no risk of float16 overflow).\n return ` float ${funcName}(int row, int col,
int depth) {\n float texR = dot(vec2(row, col), vec2(${shape[1]}, 1));\n float texC = float(depth);\n vec2 uv
= (vec2(texC, texR) + halfCR) / vec2(${texNumC}.0, ${texNumR}.0);\n return sampleTexture(${texName},
uv);\n }\n `;\n }\n\n const offset = getFlatOffsetUniformName(texName);\n return ` float ${funcName}(int
row, int col, int depth) {\n // Explicitly use integer operations as dot() only works on floats.\n int index =
row * ${stride0} + col * ${stride1} + depth + ${offset};\n vec2 uv = uvFromFlat(${texNumR}, ${texNumC},
index);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\nfunction getPackedSamplerND(inputInfo:
InputInfo): string {\n const shape = inputInfo.shapeInfo.logicalShape;\n const rank = shape.length;\n const
texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n
const texShape = inputInfo.shapeInfo.texShape;\n const packedTexShape =\n [Math.ceil(texShape[0] / 2),
Math.ceil(texShape[1] / 2)];\n const texNumR = packedTexShape[0];\n const texNumC = packedTexShape[1];\n\n
const valuesPerRow = Math.ceil(shape[rank - 1] / 2);\n let texelsInBatch = valuesPerRow * Math.ceil(shape[rank -
2] / 2);\n let params = `int b, int row, int col`;\n let index = `b * ${texelsInBatch} + (row / 2) * ${valuesPerRow} +
(col / 2)`;\n for (let b = 2; b < rank - 1; b++) {\n params = `int b${b}, ` + params;\n texelsInBatch *= shape[rank
- b - 1];\n index = `b${b} * ${texelsInBatch} + ` + index;\n }\n const glsl = getGlslDifferences();\n return `
vec4 ${funcName}(${params}) {\n int index = ${index};\n int texR = index / ${texNumC};\n int texC =
index - texR * ${texNumC};\n vec2 uv = (vec2(texC, texR) + halfCR) / vec2(${texNumC}, ${texNumR});\n
return ${glsl.texture2D}(${texName}, uv);\n }\n `;\n }\n\nfunction getSampler4D(inputInfo: InputInfo): string {\n
const shape = inputInfo.shapeInfo.logicalShape;\n const texName = inputInfo.name;\n const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n const stride2 = shape[3];\n const stride1 = shape[2] *
stride2;\n const stride0 = shape[1] * stride1;\n const {newShape, keptDims} = util.squeezeShape(shape);\n if
(newShape.length < shape.length) {\n const newInputInfo = squeezeInputInfo(inputInfo, newShape);\n const
params = ['row', 'col', 'depth', 'depth2'];\n return ` float
${funcName}(int row, int col, int depth, int depth2) {\n return ${funcName}(${getSqueezedParams(params,
keptDims)});\n }\n `;\n }\n\n if (inputInfo.shapeInfo.isUniform) {\n // Uniform arrays will be less than
65505 (no risk of float16 overflow).\n return ` float ${funcName}(int row, int col, int depth, int depth2) {\n
int index = round(dot(vec4(row, col, depth, depth2),\n vec4(${stride0}, ${stride1}, ${stride2},
1)));\n ${getUniformSampler(inputInfo)}\n }\n `;\n }\n\n const flatOffset =
inputInfo.shapeInfo.flatOffset;\n const texShape = inputInfo.shapeInfo.texShape;\n const texNumR =
texShape[0];\n const texNumC = texShape[1];\n\n if (texNumC === stride0 && flatOffset == null) {\n // texC is
used directly as physical (no risk of float16 overflow).\n return ` float ${funcName}(int row, int col, int
depth, int depth2) {\n float texR = float(row);\n float texC =\n dot(vec3(col, depth, depth2),\n
vec3(${stride1}, ${stride2}, 1));\n vec2 uv = (vec2(texC, texR) + halfCR) /\n vec2(${texNumC}.0,
${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n if (texNumC === stride2 &&
flatOffset == null) {\n // texR is used directly as physical (no risk of float16 overflow).\n return ` float
${funcName}(int row, int col, int depth, int depth2) {\n float texR = dot(vec3(row, col, depth),\n
vec3(${shape[1] * shape[2]}, ${shape[2]}, 1));\n float texC = float(depth2);\n vec2 uv = (vec2(texC, texR)
+ halfCR) /\n vec2(${texNumC}.0, ${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n
const offset = getFlatOffsetUniformName(texName);\n return ` float ${funcName}(int row, int
col, int depth, int depth2) {\n // Explicitly use integer operations as dot() only works on floats.\n int index =
row * ${stride0} + col * ${stride1} +\n depth * ${stride2} + depth2;\n vec2 uv =
uvFromFlat(${texNumR}, ${texNumC}, index + ${offset});\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n
function getSampler5D(inputInfo: InputInfo): string {\n const shape = inputInfo.shapeInfo.logicalShape;\n
const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() +
texName.slice(1);\n const stride3 = shape[4];\n const stride2 = shape[3] * stride3;\n const stride1 = shape[2] *
stride2;\n const stride0 = shape[1] * stride1;\n const {newShape, keptDims} = util.squeezeShape(shape);\n if
(newShape.length < shape.length) {\n const newInputInfo = squeezeInputInfo(inputInfo, newShape);\n const

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params = ['row', 'col', 'depth', 'depth2', 'depth3'];\n return \n    ${getSamplerFromInInfo(newInputInfo)}\n float ${funcName}(int row, int col, int depth, int depth2, int depth3) {\n    return\n    ${funcName}(${getSqueezedParams(params, keptDims)});\n    }\n    }\n    }\n    if (inputInfo.shapeInfo.isUniform)\n    {\n    // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n    return \n    float ${funcName}(int\n    row, int col, int depth, int depth2, int depth3) {\n    float index = dot(\n    vec4(row, col, depth, depth2),\n    vec4(${stride0}, ${stride1}, ${stride2}, ${stride3})) +\n    depth3;\n    ${getUniformSampler(inputInfo)}\n    }\n    }\n    }\n    const flatOffset = inputInfo.shapeInfo.flatOffset;\n    const texShape =\n    inputInfo.shapeInfo.texShape;\n    const texNumR = texShape[0];\n    const texNumC = texShape[1];\n    if (texNumC\n    === stride0 && flatOffset === null) {\n    // texC is used directly as physical (no risk of float16 overflow).\n    return\n    \n    float ${funcName}(int row, int col, int depth, int depth2, int depth3) {\n    int texR = row;\n    float texC\n    = dot(vec4(col, depth, depth2, depth3),\n    vec4(${stride1}, ${stride2}, ${stride3}, 1));\n    vec2 uv\n    = (vec2(texC, texR) + halfCR) ^\n    vec2(${texNumC}.0, ${texNumR}.0);\n    return\n    sampleTexture(${texName}, uv);\n    }\n    }\n    }\n    if (texNumC === stride3 && flatOffset === null) {\n    //\n    texR is used directly as physical (no risk of float16 overflow).\n    return \n    float ${funcName}(int row, int col,\n    int depth, int depth2, int depth3) {\n    float texR = dot(\n    vec4(row, col, depth, depth2),\n    vec4(${shape[1] * shape[2] * shape[3]},\n    ${shape[2] * shape[3]}, ${shape[3]}, 1));\n    int texC =\n    depth3;\n    vec2 uv = (vec2(texC, texR) + halfCR) ^\n    vec2(${texNumC}.0, ${texNumR}.0);\n    return\n    sampleTexture(${texName}, uv);\n    }\n    }\n    }\n    }\n    const offset =\n    getFlatOffsetUniformName(texName);\n    return \n    float ${funcName}(int row, int col, int depth, int depth2, int\n    depth3) {\n    // Explicitly use integer operations as dot() only works on floats.\n    int index = row * ${stride0} +\n    col * ${stride1} + depth * ${stride2} +\n    depth2 * ${stride3} + depth3 + ${offset};\n    vec2 uv =\n    uvFromFlat(${texNumR}, ${texNumC}, index);\n    return\n    sampleTexture(${texName}, uv);\n    }\n    }\n    }\n    }\n    function getSampler6D(inputInfo: InputInfo): string {\n    const shape = inputInfo.shapeInfo.logicalShape;\n    const texName = inputInfo.name;\n    const funcName = 'get' + texName.charAt(0).toUpperCase() +\n    texName.slice(1);\n    const {newShape, keptDims} = util.squeezeShape(shape);\n    if (newShape.length <\n    shape.length) {\n    const newInputInfo = squeezeInputInfo(inputInfo, newShape);\n    const params = ['row', 'col',\n    'depth', 'depth2', 'depth3', 'depth4'];\n    return \n    ${getSamplerFromInInfo(newInputInfo)}\n    float\n    ${funcName}(int row, int col, int depth,\n    int depth2, int depth3, int depth4) {\n    return\n    ${funcName}(${getSqueezedParams(params, keptDims)});\n    }\n    }\n    }\n    }\n    const stride4 = shape[5];\n    const\n    stride3 = shape[4] * stride4;\n    const stride2 = shape[3] * stride3;\n    const\n    stride1 = shape[2] * stride2;\n    const\n    stride0 = shape[1] * stride1;\n    if (inputInfo.shapeInfo.isUniform) {\n    // Uniform arrays will be less than 65505\n    (no risk of float16 overflow).\n    return \n    float ${funcName}(int row, int col, int depth,\n    int depth2,\n    int depth3, int depth4) {\n    int index = round(dot(\n    vec4(row, col, depth, depth2),\n    vec4(${stride0},\n    ${stride1}, ${stride2}, ${stride3})) +\n    dot(\n    vec2(depth3, depth4),\n    vec2(${stride4}, 1));\n    ${getUniformSampler(inputInfo)}\n    }\n    }\n    }\n    }\n    const flatOffset = inputInfo.shapeInfo.flatOffset;\n    const\n    texShape = inputInfo.shapeInfo.texShape;\n    const texNumR = texShape[0];\n    const texNumC = texShape[1];\n    if\n    (texNumC === stride0 && flatOffset === null) {\n    // texC is used directly as physical (no risk of float16\n    overflow).\n    return \n    float ${funcName}(int row, int col, int depth,\n    int depth2, int depth3, int\n    depth4) {\n    int texR = row;\n    float texC = dot(vec4(col, depth, depth2, depth3),\n    vec4(${stride1},\n    ${stride2}, ${stride3}, ${stride4})) +\n    float(depth4);\n    vec2 uv = (vec2(texC, texR) + halfCR) ^\n    vec2(${texNumC}.0, ${texNumR}.0);\n    return\n    sampleTexture(${texName}, uv);\n    }\n    }\n    }\n    }\n    if\n    (texNumC === stride4 && flatOffset === null) {\n    // texR is used directly as physical (no risk of float16\n    overflow).\n    return \n    float ${funcName}(int row, int col, int depth,\n    int depth2, int depth3, int\n    depth4) {\n    float texR = dot(vec4(row, col, depth, depth2),\n    vec4(${shape[1] * shape[2] * shape[3] *\n    shape[4]},\n    ${shape[2] * shape[3] * shape[4]},\n    ${shape[3] * shape[4]},\n    ${shape[4]})) +\n    float(depth3);\n    int texC = depth4;\n    vec2 uv = (vec2(texC, texR) + halfCR) ^\n    vec2(${texNumC}.0, ${texNumR}.0);\n    return\n    sampleTexture(${texName}, uv);\n    }\n    }\n    }\n    }\n    const\n    offset = getFlatOffsetUniformName(texName);\n    return \n    float ${funcName}(int row, int col, int depth,\n    int

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int depth2, int depth3, int depth4) {\n // Explicitly use integer operations as dot() only works on floats.\n int
index = row * ${stride0} + col * ${stride1} + depth * ${stride2} +\n depth2 * ${stride3} + depth3 *
${stride4} + depth4 + ${offset};\n vec2 uv = uvFromFlat(${texNumR}, ${texNumC}, index);\n return
sampleTexture(${texName}, uv);\n }\n }\n\nfunction getUniformSampler(inputInfo: InputInfo): string {\n
const texName = inputInfo.name;\n const inSize = util.sizeFromShape(inputInfo.shapeInfo.logicalShape);\n\n if
(inSize < 2) {\n return `return ${texName}`;\n }\n return `\n for (int i = 0; i < ${inSize}; i++) {\n if (i ==
index) {\n return ${texName}[i];\n }\n }\n }\n }\n\nfunction getPackedSamplerAtOutputCoords(\n
inputInfo: InputInfo, outShapeInfo: ShapeInfo) {\n const texName = inputInfo.name;\n const texFuncSnippet =
texName.charAt(0).toUpperCase() + texName.slice(1);\n const funcName = 'get' + texFuncSnippet +
'AtOutCoords';\n const inRank = inputInfo.shapeInfo.logicalShape.length;\n const outRank =
outShapeInfo.logicalShape.length;\n\n const broadcastDims = getBroadcastDims(\n
inputInfo.shapeInfo.logicalShape, outShapeInfo.logicalShape);\n\n const type = getCoordsDataType(outRank);\n
const rankDiff = outRank - inRank;\n let coordsSnippet: string;\n const fields = ['x', 'y', 'z', 'w', 'u', 'v'];\n\n if
(inRank === 0) {\n coordsSnippet = ";\n } else if (outRank < 2 && broadcastDims.length >= 1) {\n
coordsSnippet = 'coords = 0;'\n } else {\n coordsSnippet =\n broadcastDims.map(d => `coords.${fields[d +
rankDiff]} = 0;`)\n .join("\\n");\n }\n let unpackedCoordsSnippet = ";\n if (outRank < 2 && inRank > 0) {\n
unpackedCoordsSnippet = 'coords';\n } else {\n unpackedCoordsSnippet = inputInfo.shapeInfo.logicalShape\n
.map((s, i) => `coords.${fields[i + rankDiff]}`)\n .join(', ');\n }\n }\n let output =
`return outputValue`;\n const inSize = util.sizeFromShape(inputInfo.shapeInfo.logicalShape);\n const
isInputScalar = inSize === 1;\n const outSize = util.sizeFromShape(outShapeInfo.logicalShape);\n const
isOutputScalar = outSize === 1;\n\n if (inRank === 1 && !isInputScalar && !isOutputScalar) {\n output = `\n
return vec4(outputValue.xy, outputValue.xy);\n `;\n } else if (isInputScalar && !isOutputScalar) {\n if (outRank
=== 1) {\n output = `\n return vec4(outputValue.x, outputValue.x, 0., 0.);`;\n } else {\n output =
`\n return vec4(outputValue.x);\n `;\n }\n } else if (broadcastDims.length) {\n const rows = inRank - 2;\n
const cols = inRank - 1;\n if (broadcastDims.indexOf(rows) > -1 && broadcastDims.indexOf(cols) > -1) {\n
output = `return vec4(outputValue.x);`;\n } else if (broadcastDims.indexOf(rows) > -1) {\n output = `return
vec4(outputValue.x, outputValue.y, ` +\n `outputValue.x, outputValue.y);`;\n } else if
(broadcastDims.indexOf(cols) > -1) {\n output = `return vec4(outputValue.xx, outputValue.zz);`;\n }\n }\n }\n\n
return `\n vec4 ${funcName}() {\n ${type} coords = getOutputCoords();\n ${coordsSnippet}\n vec4
outputValue = get${texFuncSnippet}(${unpackedCoordsSnippet});\n ${output}\n }\n }\n }\n\nfunction
getSamplerAtOutputCoords(\n inputInfo: InputInfo, outShapeInfo: ShapeInfo) {\n const texName =
inputInfo.name;\n const texFuncSnippet = texName.charAt(0).toUpperCase() + texName.slice(1);\n const
funcName = 'get' + texFuncSnippet + 'AtOutCoords';\n const outTexShape = outShapeInfo.texShape;\n const
inTexShape = inputInfo.shapeInfo.texShape;\n const inRank = inputInfo.shapeInfo.logicalShape.length;\n const
outRank = outShapeInfo.logicalShape.length;\n\n if (!inputInfo.shapeInfo.isUniform && inRank === outRank
&&\n inputInfo.shapeInfo.flatOffset == null &&\n util.arraysEqual(inTexShape, outTexShape)) {\n return
`\n float ${funcName}() {\n return sampleTexture(${texName}, resultUV);\n }\n `;\n }\n\n const type
= getCoordsDataType(outRank);\n const broadcastDims = getBroadcastDims(\n
inputInfo.shapeInfo.logicalShape, outShapeInfo.logicalShape);\n const rankDiff = outRank - inRank;\n let
coordsSnippet: string;\n const fields = ['x', 'y', 'z', 'w', 'u', 'v'];\n\n if (inRank === 0) {\n coordsSnippet = ";\n }
else if (outRank < 2 && broadcastDims.length >= 1) {\n coordsSnippet = 'coords = 0;'\n } else {\n
coordsSnippet =\n broadcastDims.map(d => `coords.${fields[d + rankDiff]} = 0;`)\n .join("\\n");\n }\n let
unpackedCoordsSnippet = ";\n if (outRank < 2 && inRank > 0) {\n unpackedCoordsSnippet = 'coords';\n }
else {\n unpackedCoordsSnippet = inputInfo.shapeInfo.logicalShape\n .map((s, i) =>
`coords.${fields[i + rankDiff]}`)\n .join(', ');\n }\n }\n return `\n float ${funcName}() {\n
${type} coords = getOutputCoords();\n ${coordsSnippet}\n return
get${texFuncSnippet}(${unpackedCoordsSnippet});\n }\n }\n }\n\nexport function getCoordsDataType(rank:
number): string {\n if (rank <= 1) {\n return 'int';\n } else if (rank === 2) {\n return 'ivec2';\n } else if (rank

```

```

=== 3) {\n  return 'ivec3';\n } else if (rank === 4) {\n  return 'ivec4';\n } else if (rank === 5) {\n  return
'ivec5';\n } else if (rank === 6) {\n  return 'ivec6';\n } else {\n  throw Error(`GPU for rank ${rank} is not yet
supported`);\n }\n}\n\n/** Returns a new input info (a copy) that has a squeezed logical shape. */\nfunction
squeezeInputInfo(\n  inInfo: InputInfo, squeezedShape: number[]): InputInfo {\n // Deep copy.\n const
newInputInfo: InputInfo = JSON.parse(JSON.stringify(inInfo));\n newInputInfo.shapeInfo.logicalShape =
squeezedShape;\n return newInputInfo;\n}\n\nfunction getSqueezedParams(params: string[], keptDims: number[]):
string {\n return keptDims.map(d => params[d]).join(', ');}\n}\n\n", "/*\n * @license\n * Copyright 2017 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {env, Tensor, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUContext} from
'./gpgpu_context';\n\nimport * as shader_compiler from './shader_compiler';\n\nimport {InputInfo, ShapeInfo} from
'./shader_compiler';\n\nimport {PackingScheme, TextureData, TextureUsage} from './tex_util';\n\nexport interface
GPGPUProgram {\n  variableNames: string[];\n  outputShape: number[];\n  userCode: string;\n  /** If true, this
program expects packed input textures. Defaults to false. */\n  packedInputs?: boolean;\n  /** If true, this program
produces a packed texture. Defaults to false. */\n  packedOutput?: boolean;\n  /**\n   * Affects what type of texture
we allocate for the output. Defaults to\n   * `TextureUsage.RENDER`.\n   */\n  outTexUsage?: TextureUsage;\n  /**\n   * The type of scheme to use when packing texels for the output values.\n   * See `PackingScheme` for details.
Defaults to `PackingScheme.SHARED_BATCH`.\n   */\n  outPackingScheme?: PackingScheme;\n}\n\nexport
interface GPGPUBinary {\n  webGLProgram: WebGLProgram;\n  program: GPGPUProgram;\n  uniformLocations:
{[name: string]: WebGLUniformLocation};\n  source: string;\n  inShapeInfos: ShapeInfo[];\n  outShapeInfo:
ShapeInfo;\n  infLoc: WebGLUniformLocation;\n  nanLoc: WebGLUniformLocation;\n}\n\nexport interface
TensorData {\n  shape: number[];\n  texData: TextureData;\n  isUniform: boolean;\n // Available when we decide to
upload as uniform instead of texture.\n  uniformValues?: TypedArray;\n}\n\nexport function compileProgram<T
extends Tensor, K extends Tensor>(\n  gpgpu: GPGPUContext, program: GPGPUProgram, inputs: TensorData[],\n  output: TensorData): GPGPUBinary {\n  const userCode = program.userCode;\n  const inputInfos: InputInfo[] =
inputs.map((input, i) => {\n    const shapeInfo: ShapeInfo = {\n      logicalShape: input.shape,\n      texShape:
input.isUniform ? null : input.texData.texShape,\n      isUniform: input.isUniform,\n      isPacked: input.isUniform ?
false : input.texData.isPacked,\n      flatOffset: null\n    };\n    if (input.texData != null && input.texData.slice != null
&&\n      input.texData.slice.flatOffset > 0) {\n      shapeInfo.flatOffset = input.texData.slice.flatOffset;\n    }\n    return {name: program.variableNames[i], shapeInfo};\n  });\n  const inShapeInfos = inputInfos.map(x =>
x.shapeInfo);\n  const outShapeInfo: ShapeInfo = {\n    logicalShape: output.shape,\n    texShape:
output.texData.texShape,\n    isUniform: false,\n    isPacked: output.texData.isPacked,\n    flatOffset: null\n  };\n  const source = shader_compiler.makeShader(\n    inputInfos, outShapeInfo, userCode, program.packedInputs);\n  const webGLProgram = gpgpu.createProgram(source);\n  // Add special uniforms (NAN, INFINITY)\n  let
infLoc: WebGLUniformLocation = null;\n  const nanLoc = gpgpu.getUniformLocation(webGLProgram, 'NAN',
false);\n  if (env().getNumber('WEBGL_VERSION') === 1) {\n    infLoc =
gpgpu.getUniformLocation(webGLProgram, 'INFINITY', false);\n  }\n  // Add user-defined uniforms\n  const
uniformLocations: {[name: string]: WebGLUniformLocation} = {};\n  for (let i = 0; i <
program.variableNames.length; i++) {\n    const varName = program.variableNames[i];\n    const shouldThrow =
false;\n    uniformLocations[varName] =\n      gpgpu.getUniformLocation(webGLProgram, varName,
shouldThrow);\n    uniformLocations[`offset${varName}`] =\n      gpgpu.getUniformLocation(webGLProgram,
`offset${varName}`, shouldThrow);\n  }\n  return {\n    program,\n    source,\n    webGLProgram,\n    uniformLocations,\n    inShapeInfos,\n    outShapeInfo,\n    infLoc,\n    nanLoc,\n  };\n}\n\nfunction

```


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```
=====\n*\n\nimport { Abs, AbsInputs, KernelConfig, KernelFunc, TypedArray, util } from '@tensorflow/tfjs-core';\nimport { MathBackendCPU } from '../backend_cpu';\nimport { assertNotComplex } from '../cpu_util';\n\nexport function simpleAbsImpl(vals: TypedArray): Float32Array {\n  const resultValues = new Float32Array(vals.length);\n  for (let i = 0; i < vals.length; ++i) {\n    resultValues[i] = Math.abs(vals[i]);\n  }\n  return resultValues;\n}\n\nexport const abs = (args: { inputs: AbsInputs, backend: MathBackendCPU }) => {\n  const { x } = args.inputs;\n  const cpuBackend = args.backend;\n  assertNotComplex(x, 'abs');\n  let resultValues = new Float32Array(util.sizeFromShape(x.shape));\n  const values = cpuBackend.data.get(x.dataId).values as TypedArray;\n  resultValues = simpleAbsImpl(values);\n  return cpuBackend.makeOutput(resultValues, x.shape, 'float32');\n};\n\nexport const absConfig: KernelConfig = {\n  kernelName: Abs,\n  backendName: 'cpu',\n  kernelFunc: abs as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { backend_util, DataType, NumericDataType, TypedArray, util } from '@tensorflow/tfjs-core';\nimport { SimpleBinaryKernelImpl, SimpleBinaryOperation } from './binary_types';\n\n/**\n * Template that creates implementation for binary ops. Supports broadcast.\n */\nexport function createSimpleBinaryKernelImpl(op: SimpleBinaryOperation):\n  SimpleBinaryKernelImpl {\n  return (aShape: number[], bShape: number[], aVals: TypedArray, bVals: TypedArray, dtype: DataType): [TypedArray, number[]] => {\n    const newShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n    const resultRank = newShape.length;\n    const resultStrides = util.computeStrides(newShape);\n    const resultSize = util.sizeFromShape(newShape);\n    const result = util.getTypedArrayFromDType(dtype as NumericDataType, resultSize);\n    const aRank = aShape.length;\n    const bRank = bShape.length;\n    const aStrides = util.computeStrides(aShape);\n    const bStrides = util.computeStrides(bShape);\n    const aBroadcastDims = backend_util.getBroadcastDims(aShape, newShape);\n    const bBroadcastDims = backend_util.getBroadcastDims(bShape, newShape);\n    if (aBroadcastDims.length + bBroadcastDims.length === 0) {\n      for (let i = 0; i < result.length; ++i) {\n        result[i] = op(aVals[i % aVals.length], bVals[i % bVals.length]);\n      }\n    } else {\n      for (let i = 0; i < result.length; ++i) {\n        const loc = util.indexToLoc(i, resultRank, resultStrides);\n        const aLoc = loc.slice(-aRank);\n        aBroadcastDims.forEach(d => aLoc[d] = 0);\n        const aIndex = util.locToIndex(aLoc, aRank, aStrides);\n        const bLoc = loc.slice(-bRank);\n        bBroadcastDims.forEach(d => bLoc[d] = 0);\n        const bIndex = util.locToIndex(bLoc, bRank, bStrides);\n        result[i] = op(aVals[aIndex], bVals[bIndex]);\n      }\n    }\n    return [result, newShape];\n  };\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```

=====
*/\n\nimport {Complex, ComplexInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from './backend_cpu';\n\nexport function complex(args:
{inputs: ComplexInputs, backend: MathBackendCPU});\n  TensorInfo {\n  const {inputs, backend} = args;\n  const {real, imag} = inputs;\n\n  const realVals = backend.data.get(real.dataId).values as TypedArray;\n  const
imagVals = backend.data.get(imag.dataId).values as TypedArray;\n\n  const complexInfo =
backend.makeTensorInfo(real.shape, 'complex64');\n\n  const complex = backend.data.get(complexInfo.dataId);\n\n
// The complex tensor owns the underlying real and imag tensorInfos, only the\n // complex tensor tracks refCount,
when complexData is disposed the\n // underlying tensorData will be disposed.\n  complex.complexTensorInfos =
{\n  real: backend.makeTensorInfo(real.shape, 'float32', realVals),\n  imag: backend.makeTensorInfo(imag.shape,
'float32', imagVals)\n  };\n\n  return complexInfo;\n}\n\nexport const complexConfig: KernelConfig = {\n
kernelName: Complex,\n  backendName: 'cpu',\n  kernelFunc: complex as {} as KernelFunc\n};\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {DataType, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from
'./backend_cpu';\nimport {complex} from './kernels/Complex';\n\n/**\n * Generates a tensorInfo with all zeros
value.\n * @param backend cpu backend.\n * @param shape Shape for the zeros tensor.\n * @param dtype
Optional. If set, the result has this dtype.\n */\nexport function zeros(\n  backend: MathBackendCPU, shape:
number[],\n  dtype: DataType = 'float32'): TensorInfo {\n  if (dtype === 'complex64') {\n  const real =
zeros(backend, shape, 'float32');\n  const imag = zeros(backend, shape, 'float32');\n\n  return complex({inputs:
{real, imag}, backend});\n  }\n\n  const values = util.makeZerosTypedArray(util.sizeFromShape(shape), dtype);\n\n
return backend.makeTensorInfo(shape, dtype, values);\n}\n"/**\n * @license\n * Copyright 2020 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendCPU} from './backend_cpu';\n\nexport function identity(\n  args: {inputs:
IdentityInputs, backend: MathBackendCPU}): TensorInfo {\n  const {inputs, backend} = args;\n  const {x} =
inputs;\n\n  backend.incRef(x.dataId);\n\n  return {dataId: x.dataId, shape: x.shape, dtype: x.dtype};\n}\n\nexport
const identityConfig: KernelConfig = {\n  kernelName: Identity,\n  backendName: 'cpu',\n  kernelFunc: identity as
{} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*/\n\nimport {KernelConfig, KernelFunc, Real, RealInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport

```



```

{MathBackendCPU} from './backend_cpu';\n\nexport function real(args: {inputs: RealInputs, backend:
MathBackendCPU}):\n  TensorInfo {\n    const {inputs, backend} = args;\n    const {input} = inputs;\n    const real =
backend.data.get(input.dataId).complexTensorInfos.real;\n    const realVal = backend.data.get(real.dataId).values;\n\n    // When complex tensor is disposed, its underlying parts will be disposed too.\n    // Make new tensor out of the real
value of the complex. This makes sure the\n    // value is still accessible even if complex tensor is disposed.\n    return
backend.makeTensorInfo(real.shape, real.dtype, realVal);\n  }\n\nexport const realConfig: KernelConfig = {\n
kernelName: Real,\n backendName: 'cpu',\n kernelFunc: real as { } as KernelFunc\n};\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray, util} from
'@tensorflow/tfjs-core';\nimport {MathBackendCPU} from './backend_cpu';\nimport
{createSimpleBinaryKernelImpl} from './utils/binary_impl';\nimport {zeros} from './utils/zeros_impl';\nimport
{complex} from './Complex';\nimport {identity} from './Identity';\nimport {real} from './Real';\n\nexport function
cast(\n  args: {inputs: CastInputs, backend: MathBackendCPU, attrs: CastAttrs});\n  TensorInfo {\n    const
{inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dtype} = attrs;\n\n    // Casting to complex64.\n    if
(dtype === 'complex64') {\n      if (x.dtype === 'complex64') {\n        return identity({inputs: {x}, backend});\n      }\n\n      const zerosTensorInfo = zeros(backend, x.shape, x.dtype);\n      const floatX = cast({inputs: {x}, backend, attrs:
{dtype: 'float32'}});\n\n      const result =\n        complex({inputs: {real: floatX, imag: zerosTensorInfo},
backend});\n\n      backend.disposeIntermediateTensorInfo(zerosTensorInfo);\n
backend.disposeIntermediateTensorInfo(floatX);\n      return result;\n    }\n\n    // Casting from complex64\n    if
(x.dtype === 'complex64') {\n      const realPart = real({inputs: {input: x}, backend});\n      const result = cast({inputs:
{x: realPart}, backend, attrs: {dtype}});\n\n      backend.disposeIntermediateTensorInfo(realPart);\n      return
result;\n    }\n\n    if (!util.hasEncodingLoss(x.dtype, dtype)) {\n      // We don't change the underlying data, since we
cast to higher\n      // precision.\n      const result = identity({inputs: {x}, backend});\n      return {dataId: result.dataId,
shape: result.shape, dtype};\n    }\n\n    if (dtype === 'int32') {\n      const values = backend.data.get(x.dataId).values as
TypedArray;\n      const resultValues = Int32Array.from(values);\n      return backend.makeTensorInfo(x.shape, 'int32',
resultValues);\n    }\n\n    if (dtype === 'bool') {\n      // This is essentially the result of notEqual(x, 0). We avoid using\n
// kernel notEqual to avoid circular dependency, i.e. binary_utils ->\n      // cast -> notEqual -> binary_utils.\n      const xVals = backend.data.get(x.dataId).values as TypedArray;\n      const zero = util.toTypedArray([0,
x.dtype]);\n\n      const [resultData, resultShape] = createSimpleBinaryKernelImpl(\n        (a, b) => (a !== b) ? 1 :
0)(x.shape, [], xVals, zero, 'bool');\n\n      return backend.makeTensorInfo(resultShape, 'bool', resultData);\n    }\n\n    throw new Error(`Error in Cast: failed to cast ${x.dtype} to ${dtype}`);\n  }\n\nexport const castConfig:
KernelConfig = {\n  kernelName: Cast,\n  backendName: 'cpu',\n  kernelFunc: cast as { } as
KernelFunc\n};\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\nimport {backend_util, BinaryInputs, DataType, KernelFunc, TypedArray, util} from '@tensorflow/tfjs-
core';\nimport {MathBackendCPU} from './backend_cpu';\nimport {assertNotComplex} from

```

```

./cpu_util;\nimport {cast} from './kernels/Cast';\nimport {complex} from './kernels/Complex';\nimport
{ComplexBinaryKernelImpl, ComplexBinaryOperation, SimpleBinaryKernelImpl} from './binary_types';\n/**\n *
Template that creates a `KernelFunc` for binary ops.\n * @param name Kernel name.\n * @param
binaryKernelImpl A `SimpleBinaryKernelImpl` for the kernel.\n * @param binaryKernelComplexImpl Optional. If
exists, represents a\n * `ComplexBinaryKernelImpl` for the kernel, will be used when input dtype\n * is
`complex64`.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the same
dtype as the first input. This is mainly used in\n * comparison kernels, such as Equal, Less, Greater, etc.\n
*/\nexport function binaryKernelFunc(\n  name: string, simpleImpl: SimpleBinaryKernelImpl,\n  complexImpl?:
ComplexBinaryKernelImpl, dtype?: DataType): KernelFunc {\n  if (complexImpl == null) {\n    return ({inputs,
backend}) => {\n    const {a, b} = inputs as BinaryInputs;\n    const cpuBackend = backend as
MathBackendCPU;\n\n    assertNotComplex([a, b], name);\n\n    const aVals =
cpuBackend.data.get(a.dataId).values as TypedArray;\n    const bVals = cpuBackend.data.get(b.dataId).values as
TypedArray;\n\n    const $dtype = dtype || a.dtype;\n\n    const [resultData, resultShape] =\n    simpleImpl(a.shape, b.shape, aVals, bVals, $dtype);\n\n    return cpuBackend.makeTensorInfo(resultShape, $dtype,
resultData);\n  }; }\n\n  return ({inputs, backend}) => {\n    const {a, b} = inputs as BinaryInputs;\n    const
cpuBackend = backend as MathBackendCPU;\n\n    if (a.dtype === 'complex64' || b.dtype === 'complex64') {\n
const $aComplex = cast(\n      {inputs: {x: a}, backend: cpuBackend, attrs: {dtype: 'complex64'}});\n\n    const
$aComplexVals = cpuBackend.data.get($aComplex.dataId);\n\n    const aReal =
$aComplexVals.complexTensorInfos.real;\n    const aImag = $aComplexVals.complexTensorInfos.imag;\n\n    const aRealVals =\n    cpuBackend.data.get(aReal.dataId).values as Float32Array;\n    const aImagVals =\n    cpuBackend.data.get(aImag.dataId).values as Float32Array;\n\n    const $bComplex = cast(\n      {inputs: {x:
b}, backend: cpuBackend, attrs: {dtype: 'complex64'}});\n\n    const $bComplexVals =
cpuBackend.data.get($bComplex.dataId);\n\n    const bReal = $bComplexVals.complexTensorInfos.real;\n    const bImag =
$bComplexVals.complexTensorInfos.imag;\n\n    const bRealVals =\n    cpuBackend.data.get(bReal.dataId).values as Float32Array;\n    const bImagVals =\n    cpuBackend.data.get(bImag.dataId).values as Float32Array;\n\n    const [resultRealData, resultImagData,
resultShape] = complexImpl(\n      a.shape, b.shape, aRealVals, aImagVals, bRealVals, bImagVals);\n\n    const
resultReal =\n    cpuBackend.makeTensorInfo(resultShape, 'float32', resultRealData);\n\n    const resultImag
=\n    cpuBackend.makeTensorInfo(resultShape, 'float32', resultImagData);\n\n    const result = complex(\n
{inputs: {real: resultReal, imag: resultImag}, backend: cpuBackend});\n\n    cpuBackend.disposeIntermediateTensorInfo($aComplex);\n
cpuBackend.disposeIntermediateTensorInfo($bComplex);\n    cpuBackend.disposeIntermediateTensorInfo(resultReal);\n
cpuBackend.disposeIntermediateTensorInfo(resultImag);\n\n    return result;\n  } else {\n    const aVals =
cpuBackend.data.get(a.dataId).values as TypedArray;\n    const bVals = cpuBackend.data.get(b.dataId).values as
TypedArray;\n\n    const $dtype = dtype || a.dtype;\n\n    const [resultData, resultShape] =\n    simpleImpl(a.shape, b.shape, aVals, bVals, $dtype);\n\n    return cpuBackend.makeTensorInfo(resultShape, $dtype,
resultData);\n  } }\n}\n\n/**\n * Template that creates the complex type implementation for binary ops.\n *
Supports broadcast.\n */\nexport function createComplexBinaryKernelImpl(op: ComplexBinaryOperation):\n  ComplexBinaryKernelImpl {\n  return (aShape: number[], bShape: number[], aRealVals: Float32Array,\n    aImagVals: Float32Array, bRealVals: Float32Array,\n    bImagVals: Float32Array): [TypedArray, TypedArray,
number[]] => {\n    const resultShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n    const
resultSize = util.sizeFromShape(resultShape);\n    const resultRank = resultShape.length;\n    const resultStrides =
util.computeStrides(resultShape);\n\n    const resultRealVals = util.getTypedArrayFromDType('float32',
resultSize);\n    const resultImagVals = util.getTypedArrayFromDType('float32', resultSize);\n\n    const
aBroadcastDims = backend_util.getBroadcastDims(aShape, resultShape);\n    const bBroadcastDims =
backend_util.getBroadcastDims(bShape, resultShape);\n\n    const aVals =
backend_util.mergeRealAndImagArrays(aRealVals, aImagVals);\n    const bVals =

```

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backend_util.mergeRealAndImagArrays(bRealVals, bImagVals);\n\n  const aRank = aShape.length;\n  const aStrides = util.computeStrides(aShape);\n\n  const bRank = bShape.length;\n  const bStrides = util.computeStrides(bShape);\n\n  if (aBroadcastDims.length + bBroadcastDims.length === 0) {\n    for (let i = 0; i < resultRealVals.length; i++) {\n      const aIdx = i % aVals.length;\n      const bIdx = i % bVals.length;\n\n      const result =\n        op(aVals[aIdx * 2], aVals[aIdx * 2 + 1], bVals[bIdx * 2],\n          bVals[bIdx * 2 + 1]);\n\n      resultRealVals[i] = result.real;\n      resultImagVals[i] = result.imag;\n    }\n  } else {\n    for (let i = 0; i < resultRealVals.length; i++) {\n      const loc = util.indexToLoc(i, resultRank, resultStrides);\n\n      const aLoc = loc.slice(-aRank);\n      aBroadcastDims.forEach(d => aLoc[d] = 0);\n\n      const aIndex = util.locToIndex(aLoc, aRank, aStrides);\n\n      const bLoc = loc.slice(-bRank);\n      bBroadcastDims.forEach(d => bLoc[d] = 0);\n\n      const bIndex = util.locToIndex(bLoc, bRank, bStrides);\n\n      const opResult =\n        op(aVals[aIndex * 2], aVals[aIndex * 2 + 1], bVals[bIndex * 2],\n          bVals[bIndex * 2 + 1]);\n\n      resultRealVals[i] = opResult.real;\n      resultImagVals[i] = opResult.imag;\n    }\n  }\n  return [resultRealVals, resultImagVals, resultShape];\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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=====\n\n*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createSimpleBinaryKernelImpl} from './utils/binary_impl';\nimport {binaryKernelFunc, createComplexBinaryKernelImpl} from './utils/binary_utils';\n\nexport const addImpl = createSimpleBinaryKernelImpl((a, b) => a + b);\nexport const addComplexImpl =\n  createComplexBinaryKernelImpl(((aReal, aImag, bReal, bImag) => {\n    return {real: aReal + bReal, imag: aImag + bImag};\n  }));\n\nexport const add = binaryKernelFunc(Add, addImpl, addComplexImpl);\n\nexport const addConfig: KernelConfig = {\n  kernelName: Add,\n  backendName: 'cpu',\n  kernelFunc: add\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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=====\n\n*\n\nimport {buffer, DataType, Rank, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function bincountImpl(\n  xVals: TypedArray, weightsVals: TypedArray, weightsDtype: DataType,\n  weightsShape: number[], size: number): TypedArray {\n  const weightsSize = util.sizeFromShape(weightsShape);\n  const outVals = util.makeZerosTypedArray(size, weightsDtype) as TypedArray;\n\n  for (let i = 0; i < xVals.length; i++) {\n    const value = xVals[i];\n    if (value < 0) {\n      throw new Error('Input x must be non-negative!');\n    }\n\n    if (value >= size) {\n      continue;\n    }\n\n    if (weightsSize > 0) {\n      outVals[value] += weightsVals[i];\n    } else {\n      outVals[value] += 1;\n    }\n  }\n\n  return outVals;\n}\n\nexport function bincountReduceImpl<R extends Rank>(\n  xBuf: TensorBuffer<R>, weightsBuf: TensorBuffer<R>, size: number,\n  binaryOutput = false): TensorBuffer<R> {\n  const numRows = xBuf.shape[0];\n  const numCols = xBuf.shape[1];\n  const outBuf = buffer([numRows, size], weightsBuf.dtype);\n\n  for (let i = 0; i < numRows; i++) {\n    for (let j = 0; j < numCols; j++) {\n      const value = xBuf.get(i, j);\n      if (value < 0) {\n        throw new Error('Input x must be non-negative!');\n      }\n\n      if (value >= size) {\n        continue;\n      }\n\n      if (binaryOutput) {\n        outBuf.set(1, i, value);\n      } else {\n        if (weightsBuf.size > 0) {\n          outBuf.set(outBuf.get(i, value) + weightsBuf.get(i, j), i, value);\n        } else {\n          outBuf.set(outBuf.get(i, value) + 1, i, value);\n        }\n      }\n    }\n  }\n\n  return outBuf;\n}

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+ 1, i, value);\n    }\n    }\n    }\n    }\n\n    return outBuf as TensorBuffer<R>;\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n/>\n\nimport {NumericDataType, util} from '@tensorflow/tfjs-core';\nimport {SimpleUnaryImpl,\nSimpleUnaryOperation} from './unary_types';\n\n/**\n * Template that creates implementation for unary op.\n */\nexport function createSimpleUnaryImpl(op: SimpleUnaryOperation):\n  SimpleUnaryImpl {\n  return (values,\ndtype, attrs) => {\n    const newValues =\n      util.getTypedArrayFromDType(dtype as NumericDataType,\nvalues.length);\n    for (let i = 0; i < values.length; ++i) {\n      newValues[i] = op(values[i], attrs);\n    }\n    return\nnewValues;\n  };\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

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=====\n\n/>\n\nimport {DataType, KernelFunc, TypedArray, UnaryInputs, util} from '@tensorflow/tfjs-core';\nimport\n{MathBackendCPU} from './backend_cpu';\nimport {assertNotComplex} from './cpu_util';\nimport\n{SimpleUnaryImpl, SimpleUnaryOperation} from './unary_types';\n\n/**\n * Template that creates a `KernelFunc`\n * for unary ops.\n * @param name Kernel name.\n * @param op A `SimpleUnaryOperation` for the kernel.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the same dtype as the input. This is mainly used in certain\n * kernels that return bool type, such as isFinite, isInf, etc.\n */\nexport function\nunaryKernelFunc(\n  name: string, op: SimpleUnaryOperation, dtype?: DataType): KernelFunc {\n  return\n({inputs, attrs, backend}) => {\n    const {x} = inputs as UnaryInputs;\n    assertNotComplex(x, name);\n    if\n(x.dtype === 'string' || dtype === 'string') {\n      throw new Error('unaryKernelFunc does not support string\ninput/output');\n    }\n    const cpuBackend = backend as MathBackendCPU;\n    const values =\ncpuBackend.data.get(x.dataId).values as TypedArray;\n    const xSize = util.sizeFromShape(x.shape);\n    const\ndtype = dtype || x.dtype;\n    const newValues = util.getArrayFromDType(dtype, xSize);\n    for (let i = 0; i <\nxSize; ++i) {\n      newValues[i] = op(values[i], attrs);\n    }\n    return cpuBackend.makeTensorInfo(x.shape,\ndtype, newValues);\n  };\n}\n\n/**\n * Template that creates a `KernelFunc` for unary ops from the given\n * `SimpleUnaryImpl`.\n * @param name Kernel name.\n * @param unaryImpl A `SimpleUnaryImpl` that\n * implements the op.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the\n * same dtype as the input. This is mainly used in certain\n * kernels that return bool type, such as isFinite, isInf,\n * etc.\n */\nexport function unaryKernelFuncFromImpl(\n  name: string, unaryImpl: SimpleUnaryImpl, dtype?:\n  DataType): KernelFunc {\n  return ({inputs, attrs, backend}) => {\n    const {x} = inputs as UnaryInputs;\n    assertNotComplex(x, name);\n    if (x.dtype === 'string' || dtype === 'string') {\n      throw new\nError('unaryKernelFunc does not support string input/output');\n    }\n    const cpuBackend = backend as\nMathBackendCPU;\n    const values = cpuBackend.data.get(x.dataId).values as TypedArray;\n    const dtype =\ndtype || x.dtype;\n    const newValues = unaryImpl(values, dtype, attrs);\n    return\ncpuBackend.makeTensorInfo(x.shape, dtype, newValues);\n  };\n}\n"/**\n * @license\n * Copyright 2020\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may\n * not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing,
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software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Ceil, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createSimpleUnaryImpl} from\n'./utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\nexport const ceilImpl =\ncreateSimpleUnaryImpl((xi) => Math.ceil(xi));\nexport const ceil = unaryKernelFuncFromImpl(Ceil,\nceilImpl);\nexport const ceilConfig: KernelConfig = {\n  kernelName: Ceil,\n  backendName: 'cpu',\n  kernelFunc:\nceil,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n * License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required\n * by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n * License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

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=====\n*\n\nimport {backend_util, BackendValues, DataType, TypedArray, util} from '@tensorflow/tfjs-core';\nexport\nfunction concatImpl(\n  inputs: Array<{vals: BackendValues, shape: number[]}>, outShape: number[],\n  dtype:\n  DataType, simplyConcat: boolean): TypedArray|string[] {\n  const outVals = util.getArrayFromDType(dtype,\n    util.sizeFromShape(outShape));\n\n  if (simplyConcat && dtype !== 'string') {\n    // Use built-in TypedArray.set()\n    method for speed.\n    let offset = 0;\n    inputs.forEach(input => {\n      const size =\n        util.sizeFromShape(input.shape);\n      (outVals as TypedArray).set(input.vals as TypedArray, offset);\n      offset\n        += size;\n    });\n  } else {\n    let colOffset = 0;\n    inputs.forEach(input => {\n      const decodedData = dtype\n        === 'string' ?\n        backend_util.fromUint8ToStringArray(input.vals as Uint8Array[]) :\n        input.vals as\n        TypedArray;\n      let tIdx = 0;\n      for (let row = 0; row < input.shape[0]; ++row) {\n        const resIdx = row *\n          outShape[1] + colOffset;\n        for (let col = 0; col < input.shape[1]; ++col) {\n          outVals[resIdx + col] =\n            decodedData[tIdx++];\n        }\n        colOffset += input.shape[1];\n      });\n    }\n    return\n    outVals;\n  }\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS\n * IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See\n * the License for the specific language governing permissions and\n * limitations under the License.\n */\n
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```
=====\n*\n\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createSimpleUnaryImpl} from\n'./utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\nexport const expImpl =\ncreateSimpleUnaryImpl((xi) => Math.exp(xi));\nexport const exp = unaryKernelFuncFromImpl(Exp,\nexpImpl);\nexport const expConfig: KernelConfig = {\n  kernelName: Exp,\n  backendName: 'cpu',\n  kernelFunc:\nexp,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n * License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required\n * by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n * License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport {Expml, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createSimpleUnaryImpl} from\n'./utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\nexport const expmlImpl =\ncreateSimpleUnaryImpl((xi) => Math.expml(xi));\nexport const expml = unaryKernelFuncFromImpl(Expml,\nexpmlImpl);\nexport const expmlConfig: KernelConfig = {\n  kernelName: Expml,\n  backendName: 'cpu',\n
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kernelFunc: expm1,\n};\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createSimpleUnaryImpl} from './utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\nexport const floorImpl = createSimpleUnaryImpl((xi) => Math.floor(xi));\nexport const floor = unaryKernelFuncFromImpl(Floor, floorImpl);\nexport const floorConfig: KernelConfig = {\n  kernelName: Floor,\n  backendName: 'cpu',\n  kernelFunc: floor,\n};\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {buffer, DataType, Rank, TensorBuffer} from '@tensorflow/tfjs-core';\nexport function gatherV2Impl<R extends Rank, D extends DataType>(\n  xBuf: TensorBuffer<R, D>, indicesBuf: TensorBuffer<R, D>,\n  flattenOutputShape: number[]): TensorBuffer<R, D> {\n  const outBuf = buffer(flattenOutputShape, xBuf.dtype);\n  for (let i = 0; i < outBuf.size; ++i) {\n    const newLoc = outBuf.indexToLoc(i);\n    const originalLoc: number[] = newLoc.slice();\n    const batchIdx = originalLoc[0];\n    const indicesIdx = originalLoc[2];\n    const indicesIndex = indicesBuf.locToIndex([batchIdx, indicesIdx]);\n    originalLoc[2] = indicesBuf.values[indicesIndex] as number;\n    const originalIndex = xBuf.locToIndex(originalLoc);\n    outBuf.values[i] = xBuf.values[originalIndex];\n  }\n  return outBuf as TensorBuffer<R, D>;\n};\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createSimpleBinaryKernelImpl} from './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\nexport const greaterImpl =\n  createSimpleBinaryKernelImpl((a: number, b: number) => (a > b) ? 1 : 0);\nexport const greater =\n  binaryKernelFunc(Greater, greaterImpl, null /* complexImpl */, 'bool');\nexport const greaterConfig: KernelConfig = {\n  kernelName: Greater,\n  backendName: 'cpu',\n  kernelFunc: greater,\n};\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from
'./utils/binary_impl';\n\nimport {binaryKernelFunc} from './utils/binary_utils';\n\n\nexport const lessImpl =\ncreateSimpleBinaryKernelImpl((a: number, b: number) => (a < b) ? 1 : 0);\n\nexport const less =\nbinaryKernelFunc(Less, lessImpl, null /* complexImpl */, 'bool');\n\n\nexport const lessConfig: KernelConfig = {\nkernelName: Less,\nbackendName: 'cpu',\nkernelFunc: less\n};\n\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {TypedArray, util} from '@tensorflow/tfjs-core';\n\n\nexport function linspaceImpl(\nstart: number,
stop: number, num: number): TypedArray {\nconst step = (stop - start) / (num - 1);\n\nconst values =
util.makeZerosTypedArray(num, 'float32');\nvalues[0] = start;\nfor (let i = 1; i < values.length; i++) {\n
values[i] = values[i - 1] + step;\n}\n\nreturn values;\n}\n\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this
file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR
CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *

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```

=====\n
*\n\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\n\nimport {createSimpleUnaryImpl} from
'./utils/unary_impl';\n\n\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\n\n\nexport const logImpl =
createSimpleUnaryImpl((xi) => Math.log(xi));\n\n\nexport const log = unaryKernelFuncFromImpl(Log,
logImpl);\n\n\nexport const logConfig: KernelConfig = {\nkernelName: Log,\nbackendName: 'cpu',\nkernelFunc:
log,\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n
* You
may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an
\"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License
for the
specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {DataType, NumericDataType, TypedArray, util} from '@tensorflow/tfjs-core';\n\n\nexport function
maxImpl(\n aVals: TypedArray, reduceSize: number, outShape: number[],\n dtype: DataType): TypedArray {\n
const vals = util.getTypedArrayFromDType(\n dtype as NumericDataType, util.sizeFromShape(outShape));\n\n
for (let i = 0; i < vals.length; ++i) {\nconst offset = i * reduceSize;\nlet max = aVals[offset];\nfor (let j =
0; j
< reduceSize; ++j) {\nconst value = aVals[offset + j];\nif (value > max) {\nmax = value;\n}\n}\nvals[i] =
max;\n}\n\nreturn vals;\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
* Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance
with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR
CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing
permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\n\nimport {createSimpleBinaryKernelImpl}

```

```

from './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\n\nexport const maximumImpl =
createSimpleBinaryKernelImpl(\n  ((aValue, bValue) => Math.max(aValue, bValue)));
\nexport const maximum =
binaryKernelFunc(Maximum, maximumImpl);
\n\nexport const maximumConfig: KernelConfig = {\n  kernelName:
Maximum,\n  backendName: 'cpu',\n  kernelFunc: maximum\n};
\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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```

=====
\n
*\n\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl}
from './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\n\nexport const minimumImpl =
createSimpleBinaryKernelImpl(\n  ((aValue, bValue) => Math.min(aValue, bValue)));
\nexport const minimum =
binaryKernelFunc(Minimum, minimumImpl);
\n\nexport const minimumConfig: KernelConfig = {\n  kernelName:
Minimum,\n  backendName: 'cpu',\n  kernelFunc: minimum\n};
\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====
\n
*\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl}
from './utils/binary_impl';\nimport {binaryKernelFunc, createComplexBinaryKernelImpl} from
 './utils/binary_utils';\n\nexport const multiplyImpl =\n  createSimpleBinaryKernelImpl(((aValue, bValue) =>
aValue * bValue));
\nexport const multiplyComplexImpl =\n  createComplexBinaryKernelImpl(((aReal, aImag,
bReal, bImag) => {\n  return {\n    real: aReal * bReal - aImag * bImag,\n    imag: aReal * bImag + aImag *
bReal\n  };
\n }));
\n\nexport const multiply =\n  binaryKernelFunc(Multiply, multiplyImpl,
multiplyComplexImpl);
\n\nexport const multiplyConfig: KernelConfig = {\n  kernelName: Multiply,\n  backendName: 'cpu',\n  kernelFunc: multiply\n};
\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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\n
*\n\nimport {DataType, KernelConfig, KernelFunc, Neg, TensorInfo, TypedArray, UnaryInputs, util} from
 '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from './backend_cpu';\n\nimport {assertNotComplex} from
 './cpu_util';\n\nimport {multiplyImpl} from './Multiply';\n\nexport function negImpl(xVals: TypedArray, xShape:
number[], xDtype: DataType):\n  [TypedArray, number[]] {\n  const minusOne =\n    util.createScalarValue(-1 as
{ } as 'float32', xDtype) as TypedArray;\n  return multiplyImpl([], xShape, minusOne, xVals, xDtype);
\n}\n\nexport function neg(args: {inputs: UnaryInputs, backend: MathBackendCPU}):\n  TensorInfo {\n  const {inputs,
backend} = args;\n  const {x} = inputs;\n\n  assertNotComplex(x, 'neg');\n\n  const xVals =
backend.data.get(x.dataId).values as TypedArray;\n  const [res, newShape] = negImpl(xVals, x.shape, x.dtype);
\n\n  return backend.makeTensorInfo(newShape, x.dtype, res);
\n}\n\nexport const negConfig: KernelConfig = {\n  kernelName: Neg,\n  backendName: 'cpu',\n  kernelFunc: neg as { } as KernelFunc\n};
\n", "/*\n * @license\n *

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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createSimpleBinaryKernelImpl}\nfrom './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\nexport const notEqualImpl\n=\n  createSimpleBinaryKernelImpl(((a, b) => (a !== b) ? 1 : 0));\nexport const notEqual =\n  binaryKernelFunc(NotEqual, notEqualImpl, null /* complexOp */, 'bool');\n\nexport const notEqualConfig:\nKernelConfig = {\n  kernelName: NotEqual,\n  backendName: 'cpu',\n  kernelFunc: notEqual\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *  
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {DataType, NumericDataType, TypedArray} from '@tensorflow/tfjs-core';\nimport {util} from\n '@tensorflow/tfjs-core';\nexport function transposeImpl(\n  xVals: TypedArray, xShape: number[], dtype:\n  DataType, perm: number[],\n  newShape: number[]): TypedArray {\n  const xRank = xShape.length;\n  const xSize\n  = util.sizeFromShape(xShape);\n  const xStrides = util.computeStrides(xShape);\n  const newStrides =\n  util.computeStrides(newShape);\n\n  const result = util.getTypedArrayFromDType(\n    dtype as\n    NumericDataType, util.sizeFromShape(newShape));\n  for (let i = 0; i < xSize; ++i) {\n    const loc =\n    util.indexToLoc(i, xRank, xStrides);\n    // Permute location.\n    const newLoc: number[] = new\n    Array(loc.length);\n    for (let i = 0; i < newLoc.length; i++) {\n      newLoc[i] = loc[perm[i]];\n    }\n    const\n    newIndex = util.locToIndex(newLoc, xRank, newStrides);\n    result[newIndex] = xVals[i];\n  }\n  return\n  result;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
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=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs, TypedArray}\nfrom '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from './backend_cpu';\nimport {assertNotComplex}\nfrom './cpu_util';\nimport {transposeImpl} from './Transpose_impl';\nexport function transpose(args: {\n  inputs:\n  TransposeInputs,\n  attrs: TransposeAttrs,\n  backend: MathBackendCPU\n}): TensorInfo {\n  const {inputs, attrs,\n  backend} = args;\n  const {x} = inputs;\n  const {perm} = attrs;\n\n  assertNotComplex(x, 'transpose');\n  const\n  xRank = x.shape.length;\n  const newShape: number[] = new Array(xRank);\n  for (let i = 0; i < newShape.length;\n  i++) {\n    newShape[i] = x.shape[perm[i]];\n  }\n  const values = backend.data.get(x.dataId).values as\n  TypedArray;\n  const result = transposeImpl(values, x.shape, x.dtype, perm, newShape);\n  const dataId =\n  backend.write(result, newShape, x.dtype);\n  return {dataId, shape: newShape, dtype: x.dtype};\n}\n\nexport const\ntransposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName: 'cpu',\n  kernelFunc: transpose as\n  {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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=====\n*\n\nimport {backend_util, DataType, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, TypedArray, upcastType, util} from '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from './backend_cpu';\nimport {assertNotComplex} from './cpu_util';\nimport {transpose} from './Transpose';\n\nexport function prodImpl(\n  xShape: number[], xDtype: DataType, xVals: TypedArray,\n  reductionAxes: number[]):\n  {outVals: TypedArray, outShape: number[], outDtype: DataType} {\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(xShape, reductionAxes);\n  const outDtype = upcastType(xDtype, 'int32');\n  const outVals = util.makeZerosTypedArray(\n    util.sizeFromShape(outShape), outDtype) as TypedArray;\n  const reduceSize = util.sizeFromShape(reduceShape);\n  for (let i = 0; i < outVals.length; ++i) {\n    const offset = i * reduceSize;\n    let prod = 1;\n    for (let j = 0; j < reduceSize; ++j) {\n      prod *= xVals[offset + j];\n    }\n    outVals[i] = prod;\n  }\n  return {outVals, outShape, outDtype};\n}\n\nexport function prod(\n  args: {inputs: ProdInputs, backend: MathBackendCPU, attrs: ProdAttrs}):\n  TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis, keepDims} = attrs;\n  assertNotComplex(x, 'prod');\n  const xRank = x.shape.length;\n  const axes = util.parseAxisParam(axis, x.shape);\n  const permutation = backend_util.getAxesPermutation(axes, xRank);\n  let reductionAxes = axes;\n  let permutedX = x;\n  const intermediateTensorInfos = [];\n  if (permutation != null) {\n    permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutation}});\n    intermediateTensorInfos.push(permutedX);\n    reductionAxes = backend_util.getInnerMostAxes(reductionAxes.length, xRank);\n  }\n  const xVals = backend.data.get(permutedX.dataId).values as TypedArray;\n  const {outVals, outShape, outDtype} =\n    prodImpl(permutedX.shape, permutedX.dtype, xVals, reductionAxes);\n  let resultShape = outShape;\n  if (keepDims) {\n    resultShape = backend_util.expandShapeToKeepDim(outShape, axes);\n  }\n  intermediateTensorInfos.forEach(\n    t => backend.disposeIntermediateTensorInfo(t);\n  );\n  return backend.makeTensorInfo(resultShape, outDtype, outVals);\n}\n\nexport const prodConfig: KernelConfig = {\n  kernelName: Prod,\n  backendName: 'cpu',\n  kernelFunc: prod as {} as KernelFunc;\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {DataTypeMap, util} from '@tensorflow/tfjs-core';\n\nexport function rangeImpl(\n  start: number, stop: number, step: number,\n  dtype: 'float32'|'int32'): DataTypeMap['float32'|'int32'] {\n  const sameStartStop = start === stop;\n  const increasingRangeNegativeStep = start < stop && step < 0;\n  const decreasingRangePositiveStep = stop < start && step > 1;\n  if (sameStartStop || increasingRangeNegativeStep ||\n    decreasingRangePositiveStep) {\n    return util.makeZerosTypedArray(0, dtype);\n  }\n  const numElements = Math.abs(Math.ceil((stop - start) / step));\n  const values = util.makeZerosTypedArray(numElements, dtype);\n  if (stop < start && step === 1) {\n    // Auto adjust the step's sign if it hasn't been set\n    // (or was set to 1)\n    step = -1;\n  }\n  values[0] = start;\n  for (let i = 1; i < values.length; i++) {\n    values[i] = values[i - 1] + step;\n  }\n  return values;\n}\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
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on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport { KernelConfig, Rsqrt } from '@tensorflow/tfjs-core';\nimport { createSimpleUnaryImpl } from './utils/unary_impl';\nimport { unaryKernelFuncFromImpl } from './utils/unary_utils';\nexport const rsqrtImpl = createSimpleUnaryImpl((xi) => 1 / Math.sqrt(xi));\nexport const rsqrt = unaryKernelFuncFromImpl(Rsqrt, rsqrtImpl);\nexport const rsqrtConfig: KernelConfig = {\n  kernelName: Rsqrt,\n  backendName: 'cpu',\n  kernelFunc: rsqrt,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n=====\n
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=====\n*\n\nimport { backend_util, BackendValues, buffer, DataType, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TensorInfo, TypedArray, util } from '@tensorflow/tfjs-core';\nimport { MathBackendCPU } from './backend_cpu';\nimport { assertNotComplex } from './cpu_util';\nexport function sliceImpl(\n  vals: BackendValues, begin: number[], size: number[],\n  dtype: DataType): BackendValues {\n  const isContinuous = slice_util.isSliceContinuous(shape, begin, size);\n  const length = util.sizeFromShape(size);\n  const xStrides = util.computeStrides(shape);\n\n  if (isContinuous) {\n    const flatOffset = slice_util.computeFlatOffset(begin, xStrides);\n\n    if (dtype === 'string') {\n      return (vals as Uint8Array[]).slice(flatOffset, flatOffset + length);\n    }\n\n    return (vals as TypedArray).subarray(flatOffset, flatOffset + length);\n  }\n\n  const decodedData = dtype === 'string' ?\n    backend_util.fromUint8ToStringArray(vals as Uint8Array[]) :\n    vals as TypedArray;\n\n  const inBuf = buffer(shape, dtype, decodedData);\n  const outBuf = buffer(size, dtype);\n  for (let i = 0; i < outBuf.size; ++i) {\n    const outLoc = outBuf.indexToLoc(i);\n    const inLoc = outLoc.map((idx: number, j) => idx + begin[j]);\n    outBuf.set(inBuf.get(...inLoc), ...outLoc);\n  }\n\n  if (dtype === 'string') {\n    return backend_util.fromStringArrayToUint8(outBuf.values as string[]);\n  }\n\n  return outBuf.values as TypedArray;\n}\n\nexport function slice(\n  args: { inputs: SliceInputs, backend: MathBackendCPU, attrs: SliceAttrs }):\n  TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { begin, size } = attrs;\n\n  assertNotComplex(x, 'slice');\n  const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n  slice_util.assertParamsValid(x, $begin, $size);\n\n  const vals = backend.data.get(x.dataId).values;\n  const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n  return backend.makeTensorInfo($size, x.dtype, outVals);\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'cpu',\n  kernelFunc: slice as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n=====\n
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=====\n*\n\nimport { KernelConfig, SquaredDifference } from '@tensorflow/tfjs-core';\nimport { createSimpleBinaryKernelImpl } from './utils/binary_impl';\nimport { binaryKernelFunc } from './utils/binary_utils';\nexport const squaredDifferenceImpl = createSimpleBinaryKernelImpl(((a, b) => {\n  const diff = a - b;\n  return diff * diff;\n}));\nexport const squaredDifference =\n  binaryKernelFunc(SquaredDifference,\n
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squaredDifferenceImpl);\n\nexport const squaredDifferenceConfig: KernelConfig = {\n  kernelName:\n  SquaredDifference,\n  backendName: 'cpu',\n  kernelFunc: squaredDifference\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { buffer, Rank, TensorBuffer } from '@tensorflow/tfjs-core';\n\nexport function stridedSliceImpl<R\n  extends Rank>(\n  outShape: number[], xBuf: TensorBuffer<R>, strides: number[],\n  begin: number[]):\n  TensorBuffer<R> {\n  const outBuf = buffer(outShape, xBuf.dtype);\n  for (let i = 0; i < outBuf.size; i++) {\n  const loc = outBuf.indexToLoc(i);\n  const newLoc: number[] = new Array(loc.length);\n  for (let j = 0; j <\n  newLoc.length; j++) {\n  newLoc[j] = loc[j] * strides[j] + begin[j];\n  }\n  outBuf.set(xBuf.get(...newLoc),\n  ...loc);\n  }\n  return outBuf as TensorBuffer<R>;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { KernelConfig, Sub } from '@tensorflow/tfjs-core';\n\nimport { createSimpleBinaryKernelImpl } from\n  './utils/binary_impl';\n\nimport { binaryKernelFunc, createComplexBinaryKernelImpl } from\n  './utils/binary_utils';\n\nexport const subImpl =\n  createSimpleBinaryKernelImpl(((aValue, bValue) => aValue -\n  bValue));\n\nexport const subComplexImpl =\n  createComplexBinaryKernelImpl(((aReal, aImag, bReal, bImag) =>\n  {\n  return { real: aReal - bReal, imag: aImag - bImag; }\n  }));\n\nexport const sub = binaryKernelFunc(Sub,\n  subImpl, subComplexImpl);\n\nexport const subConfig: KernelConfig = {\n  kernelName: Sub,\n  backendName:\n  'cpu',\n  kernelFunc: sub\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { buffer, DataType, Rank, TensorBuffer } from '@tensorflow/tfjs-core';\n\n/**\n * An implementation\n * of the tile kernel shared between WebGL and CPU for string\n * tensors only.\n */\n\nexport function tileImpl<R\n  extends Rank>(\n  xBuf: TensorBuffer<R, DataType>,\n  reps: number[]): TensorBuffer<R, DataType> {\n  const\n  newShape: number[] = new Array(xBuf.rank);\n  for (let i = 0; i < newShape.length; i++) {\n  newShape[i] =\n  xBuf.shape[i] * reps[i];\n  }\n  const result = buffer(newShape, xBuf.dtype);\n  for (let i = 0; i < result.values.length;\n  ++i) {\n  const newLoc = result.indexToLoc(i);\n  const originalLoc: number[] = new Array(xBuf.rank);\n  for\n  (let j = 0; j < originalLoc.length; j++) {\n  originalLoc[j] = newLoc[j] % xBuf.shape[j];\n  }\n  const\n  originalIndex = xBuf.locToIndex(originalLoc);\n  result.values[i] = xBuf.values[originalIndex];\n  }\n  return\n  result as TensorBuffer<R, DataType>;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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=====\n*\n\n** An implementation of the TopK kernel shared between webgl and cpu. *\n\nimport {buffer, NumericDataType, Rank, ShapeMap, Tensor, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function topKImpl<T extends Tensor, R extends Rank>(\n  x: TypedArray, xShape: number[],\n  xDtype: NumericDataType, k: number,\n  sorted: boolean):\n  [TensorBuffer<R, NumericDataType>,\n  TensorBuffer<R, 'int32'>] {\n  // Reshape into a 2d tensor [batch, lastDim] and compute topk along lastDim.\n  const lastDim = xShape[xShape.length - 1];\n  const [batch, size] = [x.length / lastDim, lastDim];\n  const allTopKVals = util.getTypedArrayFromDType(xDtype, batch * k);\n  const allTopKIndices = util.getTypedArrayFromDType('int32', batch * k);\n  for (let b = 0; b < batch; b++) {\n    const offset = b * size;\n    const vals = x.subarray(offset, offset + size);\n    const valAndInd: Array<{value: number, index: number}> = [];\n    for (let i = 0; i < vals.length; i++) {\n      valAndInd.push({value: vals[i], index: i});\n    }\n    valAndInd.sort((a, b) => b.value - a.value);\n    const outOffset = b * k;\n    const topKVals = allTopKVals.subarray(outOffset, outOffset + k);\n    const topKIndices = allTopKIndices.subarray(outOffset, outOffset + k);\n    for (let i = 0; i < k; i++) {\n      topKVals[i] = valAndInd[i].value;\n      topKIndices[i] = valAndInd[i].index;\n    }\n  }\n  // Reshape back to the original input shape, except that the last\n  // dimension is k.\n  const outputShape = xShape.slice();\n  outputShape[outputShape.length - 1] = k;\n  return [\n    buffer(outputShape as ShapeMap[R], xDtype, allTopKVals),\n    buffer(outputShape as ShapeMap[R], 'int32', allTopKIndices)\n  ];\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {BackendValues, DataType, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function uniqueImpl(\n  values: BackendValues, axis: number, shape: number[], dtype: DataType): {\n  outputValues: BackendValues,\n  outputShape: number[],\n  indices: BackendValues\n} {\n  // Normalize and validate axis.\n  const $axis = util.parseAxisParam(axis, shape)[0];\n  // Calculate the new shape that is suitable for extracting data along the\n  // given axis.\n  //\n  // The rank is 3.\n  // The size of the 1st dimension is the size of all the axes < the given axis.\n  // The size of the 2nd dimension is the same as the size of the given axis.\n  // The size of the 3rd dimension is the size of all the axes > the given axis.\n  //\n  // For example, for a 4D tensor with shape=[2, 3, 5, 4] and axis=2, the\n  // newShape would be: [2*3, 5, 4].\n  // Note that this is not the final output shape. This will be the shape for an\n  // intermediate TensorBuffer (see inputBuffer below) to allow us to extract\n  // values along the given axis. To demonstrate how it works, consider the\n  // following example:\n  //\n  // Input: a 3D tensor, with shape [1, 2, 3]\n  //\n  // [1, 2, 3]\n  // [4, 5, 6]\n  //\n  // Axis: 2 (the last axis).\n  //\n  // Along axis 2, we expect to extract 3 tensors: [1, 4], [2, 5], [3, 6].\n  //\n  // For this example, newShape would be: [2, 3, 1], where 2 is calculated from\n  // 1*2. The re-shaped data would look like:\n  //\n  // [1, 2], [3]\n  //\n  // [4], [5], [6]\n  //\n  //\n  // Then, we can construct a 3-level nested loop by the following dimension\n  // order to extract the values along the axis (dimension1):\n  // i: dimension1 // 0, 1, 2\n  // m: dimension0 // 0, 1\n  // n: dimension2 // 0\n  //\n  //\n  // Iteration 0: data at [0, 0, 0] => \"1\"\n  // Iteration 1: data at [1, 0, 0] => \"4\"\n  // We got [1, 4].\n  // Iteration 2: data at [0, 1, 0] => \"2\"\n  // Iteration 3: data at [1, 1, 0] => \"5\"\n  // We got [2, 5].\n  // Iteration 4: data at [0, 2, 0] => \"3\"\n  // Iteration 5: data at [1, 2, 0] => \"6\"\n  // We got [3, 6].\n  const newShape = [1, shape[0], 1];\n  for (let i = 0; i < $axis; i++) {\n    newShape[0] *= shape[i];\n  }\n  newShape[1] = shape[$axis];\n  for (let i = $axis + 1; i < shape.length; i++) {\n    newShape[2] *= shape[i];\n  }\n}
```

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// A map from unique elements (their string representations) to their values\n // in \"indices\" (below).\n const
uniqueElements: {[key: string]: number} = {};\n // The indices of each unique element in the original tensor along
the given\n // axis. It is 1D and has the same size as the given axis.\n const indices = new
Int32Array(shape[$axis]);\n // Create a buffer so we can easily extract value at a given location.\n const
inputBuffer = new TensorBuffer(newShape, dtype, values as TypedArray);\n // The indices along the given axis
that have unique elements. This is a\n // de-duped version of \"indices\" above.\n const uniqueIndices: number[] =
[];\n const is1DTensor = newShape[0] === 1 && newShape[2] === 1;\n for (let i = 0; i < shape[$axis]; i++) {\n
// Extract values along the axis.\n let element: string;\n if (is1DTensor) {\n // Fast path for 1D tensor input.\n
element = values[i].toString();\n } else {\n const axisValues = [];\n for (let m = 0; m < newShape[0]; m++)
{\n for (let n = 0; n < newShape[2]; n++) {\n axisValues.push(inputBuffer.get(m, i, n));\n }\n }\n
element = axisValues.join(',');\n }\n\n // Dedup and update various indices.\n if (uniqueElements[element] !==
undefined) {\n indices[i] = uniqueElements[element];\n } else {\n const uniqueIndex =
Object.keys(uniqueElements).length;\n uniqueElements[element] = uniqueIndex;\n indices[i] =
uniqueIndex;\n uniqueIndices.push(i);\n }\n }\n\n // Now we know where each of the unique elements are
located along the axis\n // (uniqueIndices). Extract them from input buffer and store them in the\n // output
buffer.\n const outputTmpShape = newShape.slice();\n outputTmpShape[1] =
Object.keys(uniqueElements).length;\n const outputBuffer = new TensorBuffer(outputTmpShape, dtype);\n
uniqueIndices.forEach((uniqueElementIndex, i) => {\n for (let m = 0; m < newShape[0]; m++) {\n for (let n =
0; n < newShape[2]; n++) {\n outputBuffer.set(inputBuffer.get(m, uniqueElementIndex, n), m, i, n);\n }\n
});\n\n // The output shape can be calculated from the input shape with the size of\n // the given axis replaced
by the number of unique elements along that axis.\n const outputShape = shape.slice();\n outputShape[$axis] =
outputTmpShape[1];\n\n return {\n outputValues: outputBuffer.values as BackendValues,\n outputShape,\n
indices,\n };}\n\n\"/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *

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=====\n
*\n\n// Shared functionality among backends.\nexport {simpleAbsImpl} from './kernels/Abs';\nexport {addImpl}
from './kernels/Add';\nexport {bincountImpl, bincountReduceImpl} from './kernels/Bincount_impl';\nexport
{ceilImpl} from './kernels/Ceil';\nexport {concatImpl} from './kernels/Concat_impl';\nexport {expImpl} from
 './kernels/Exp';\nexport {expm1Impl} from './kernels/Expm1';\nexport {floorImpl} from './kernels/Floor';\nexport
{gatherV2Impl} from './kernels/GatherV2_impl';\nexport {greaterImpl} from './kernels/Greater';\nexport {lessImpl}
from './kernels/Less';\nexport {linSpaceImpl} from './kernels/LinSpace_impl';\nexport {logImpl} from
 './kernels/Log';\nexport {maxImpl} from './kernels/Max_impl';\nexport {maximumImpl} from
 './kernels/Maximum';\nexport {minimumImpl} from './kernels/Minimum';\nexport {multiplyImpl} from
 './kernels/Multiply';\nexport {negImpl} from './kernels/Neg';\nexport {notEqualImpl} from
 './kernels/NotEqual';\nexport {prodImpl} from './kernels/Prod';\nexport {rangeImpl} from
 './kernels/Range_impl';\nexport {rsqrtImpl} from './kernels/Rsqrt';\nexport {sliceImpl} from
 './kernels/Slice';\nexport {squaredDifferenceImpl} from './kernels/SquaredDifference';\nexport {stridedSliceImpl}
from './kernels/StridedSlice_impl';\nexport {subImpl} from './kernels/Sub';\nexport {tileImpl} from
 './kernels/Tile_impl';\nexport {topKImpl} from './kernels/TopK_impl';\nexport {transposeImpl} from
 './kernels/Transpose_impl';\nexport {uniqueImpl} from './kernels/Unique_impl';\nexport
{ComplexBinaryKernelImpl, SimpleBinaryKernelImpl} from './utils/binary_types';\n\n\"/*\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the

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```
=====\n*\n\n// Import shared functionality from tfjs-backend-cpu without triggering\n// side effects.\n// tslint:disable-next-line: no-imports-from-dist\nimport * as shared from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {SimpleBinaryKernelImpl} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {SimpleUnaryImpl} from '@tensorflow/tfjs-backend-cpu/dist/utils/unary_types';\n\nexport type SimpleBinaryKernelImplCPU = SimpleBinaryKernelImpl;\nexport type SimpleUnaryKernelImplCPU = SimpleUnaryImpl;\n\nconst {\n  addImpl: addImplCPU,\n  bincountImpl: bincountImplCPU,\n  bincountReduceImpl: bincountReduceImplCPU,\n  ceilImpl: ceilImplCPU,\n  concatImpl: concatImplCPU,\n  expImpl: expImplCPU,\n  expm1Impl: expm1ImplCPU,\n  floorImpl: floorImplCPU,\n  gatherV2Impl: gatherV2ImplCPU,\n  greaterImpl: greaterImplCPU,\n  lessImpl: lessImplCPU,\n  linspaceImpl: linspaceImplCPU,\n  logImpl: logImplCPU,\n  maxImpl: maxImplCPU,\n  maximumImpl: maximumImplCPU,\n  minimumImpl: minimumImplCPU,\n  multiplyImpl: multiplyImplCPU,\n  negImpl: negImplCPU,\n  prodImpl: prodImplCPU,\n  rangeImpl: rangeImplCPU,\n  rsqrtImpl: rsqrtImplCPU,\n  simpleAbsImpl: simpleAbsImplCPU,\n  sliceImpl: sliceImplCPU,\n  stridedSliceImpl: stridedSliceImplCPU,\n  subImpl: subImplCPU,\n  tileImpl: tileImplCPU,\n  topKImpl: topKImplCPU,\n  transposeImpl: transposeImplCPU,\n  uniqueImpl: uniqueImplCPU,\n} = shared;\n\nexport {\n  addImplCPU,\n  bincountImplCPU,\n  bincountReduceImplCPU,\n  ceilImplCPU,\n  concatImplCPU,\n  expImplCPU,\n  expm1ImplCPU,\n  floorImplCPU,\n  gatherV2ImplCPU,\n  greaterImplCPU,\n  lessImplCPU,\n  linspaceImplCPU,\n  logImplCPU,\n  maxImplCPU,\n  maximumImplCPU,\n  minimumImplCPU,\n  multiplyImplCPU,\n  negImplCPU,\n  prodImplCPU,\n  simpleAbsImplCPU,\n  sliceImplCPU,\n  stridedSliceImplCPU,\n  subImplCPU,\n  rangeImplCPU,\n  rsqrtImplCPU,\n  tileImplCPU,\n  topKImplCPU,\n  transposeImplCPU,\n  uniqueImplCPU,\n};\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nexport function getVecChannels(name: string, rank: number): string[] {\n  return ['x', 'y', 'z', 'w', 'u', 'v'].slice(0, rank).map(d => `${name}.${d}`);\n}\n\nexport function getChannels(name: string, rank: number): string[] {\n  if (rank === 1) {\n    return [name];\n  }\n  return getVecChannels(name, rank);\n}\n\nexport function getSourceCoords(rank: number, dims: string[]): string {\n  if (rank === 1) {\n    return 'rc';\n  }\n  let coords = '';\n  for (let i = 0; i < rank; i++) {\n    coords += dims[i];\n    if (i < rank - 1) {\n      coords += ',';\n    }\n  }\n  return coords;\n}\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class PackProgram implements GPGPUProgram {\n
```

```

variableNames = ['A'];\n outputShape: number[];\n userCode: string;\n packedInputs = false;\n packedOutput =
true;\n\n constructor(\n  outputShape:\n  number[]) { //
TODO(https://github.com/tensorflow/tfjs/issues/893):\n  // Only input / output 3D tensors.\n
this.outputShape = outputShape;\n  const rank = outputShape.length;\n\n  if (rank === 0) {\n    this.userCode =
\n    void main() {\n      setOutput(vec4(getA(), 0., 0., 0.));\n    } \n  } else {\n    const channels =
getChannels('rc', rank);\n    const dtype = getCoordsDataType(rank);\n    const outOfBoundsCondition =\ngetOutOfBoundsCondition(rank, outputShape, channels);\n    const setup = getSetup(\n  rank,
outputShape[outputShape.length - 1],\n  outputShape[outputShape.length - 2], channels);\n    const output =
getOutput(outputShape, channels);\n\n    this.userCode = \n    void main() {\n      ${dtype} rc =
getOutputCoords();\n\n      if(${outOfBoundsCondition}) {\n        setOutput(vec4(0));\n      } else {\n
${setup}\n\n        setOutput(vec4(${output}));\n      }\n    } \n  }\n}\n\nfunction
getSourceCoordsArr(rank: number, dims: string[]): string[] {\n  const coords = [];\n\n  for (let row = 0; row <= 1;
row++) {\n    for (let col = 0; col <= 1; col++) {\n      let coord = `${row === 0 ? 'r' : 'rp1'}`, ${col === 0 ? 'c' :
'cp1'}`;\n\n      for (let d = 2; d < rank; d++) {\n        coord = `${dims[dims.length - 1 - d]},` + coord;\n      }\n\n
coords.push(coord);\n    } \n  }\n  return coords;\n}\n\nfunction getOutOfBoundsCondition(\n  rank: number, shape:
number[], dims: string[]): string {\n  if (rank === 1) {\n    return `rc > ${shape[0]}`;\n  }\n\n  let cond = ";\n  for (let
i = rank - 2; i < rank; i++) {\n    cond += `${dims[i]} >= ${shape[i]}`;\n    if (i < rank - 1) {\n      cond += '|';\n    }\n  }\n\n
return cond;\n}\n\nfunction getSetup(\n  rank: number, cols: number, rows: number, dims: string[]): string
{\n  if (rank === 1) {\n    return ";\n  }\n\n  const innerDims = dims.slice(-2);\n\n  return \n  int r =
${innerDims[0]};\n  int c = ${innerDims[1]};\n  int rp1 = r + 1;\n  int cp1 = c + 1;\n  bool cEdge = cp1 >=
${cols};\n  bool rEdge = rp1 >= ${rows};\n  `;\n}\n\nfunction getOutput(shape: number[], dims: string[]): string
{\n  const rank = shape.length;\n  const sourceCoords = getSourceCoordsArr(rank, dims);\n  if (rank === 1) {\n
return `getA(rc),\n    rc + 1 >= ${shape[0]} ? 0. : getA(rc + 1),\n    0, 0`;\n  }\n\n  return
`getA(${sourceCoords[0]}),\n    cEdge ? 0. : getA(${sourceCoords[1]}),\n    rEdge ? 0. :
getA(${sourceCoords[2]}),\n    rEdge || cEdge ? 0. : getA(${sourceCoords[3]})`;\n}\n\n","/**\n * @license\n *
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=====\n
*\n\nimport { GPGPUProgram } from './gpgpu_math';\nimport * as shader_util from
'/shader_compiler_util';\n\nexport class ReshapePackedProgram implements GPGPUProgram {\n  variableNames =
['A'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(outputShape: [number, number, number], inputShape: [\n  number, number, number\n  ]) {\n
this.outputShape = outputShape;\n\n    let mainLoop = ``;\n    for (let i = 0; i < 4; i++) {\n      let thisRC = `thisRC =
rc`;\n      if (i % 2 === 1) {\n        thisRC += `thisRC.z += 1`;\n      }\n      if (i > 1) {\n        thisRC += `thisRC.y +=
1`;\n      }\n\n      mainLoop += `\n      ${thisRC}\n      ${i > 0 ? `if(thisRC.y < rows && thisRC.z < cols)` : ` `}`;\n\n
int flatIndex = getFlatIndex(thisRC);\n      ivec3 inputRC =
inputCoordsFromReshapedOutCoords(flatIndex);\n      vec2 inputRCInnerDims =
vec2(float(inputRC.y),float(inputRC.z));\n      result[${i}] =\n      getChannel(getA(inputRC.x, inputRC.y,
inputRC.z), inputRCInnerDims);\n      ${i > 0 ? `'': ` `}`;\n    }\n\n    this.userCode = \n
${getReshapedInputCoords(inputShape)}\n    ${shader_util.getFlatIndexFrom3D(outputShape)}\n\n    void
main() {\n      ivec3 rc = getOutputCoords();\n      vec4 result = vec4(0.);\n      ivec3 thisRC;\n      int rows =
${outputShape[1]};\n      int cols = ${outputShape[2]};\n\n      ${mainLoop}\n      setOutput(result);\n    }\n  }
}\n\nfunction getReshapedInputCoords(shape: [number, number, number]): string {\n  const
coordsFromIndexSnippet =\n  shader_util.getLogicalCoordinatesFromFlatIndex(['r', 'c', 'd'], shape);\n\n  return `

```


ivec3 inputCoordsFromReshapedOutCoords(int index) {\n \${coordsFromIndexSnippet}\n return ivec3(r, c, d);\n }\n `;\n}\n", "/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nimport {GPGPUContext} from './gpgpu_context';\n\nimport {getInternalFormatForFloat16MatrixTexture, getInternalFormatForFloat16PackedMatrixTexture, getInternalFormatForFloat32MatrixTexture, getInternalFormatForPackedMatrixTexture, getInternalFormatForUnsignedBytesMatrixTexture} from './gpgpu_util';\n\nimport {getPackedMatrixTextureShapeWidthHeight, getUnpackedMatrixTextureShapeWidthHeight, PhysicalTextureType, TextureConfig, TextureUsage} from './tex_util';\n\nexport class TextureManager {\n  private numUsedTextures = 0;\n  private numFreeTextures = 0;\n  private _numBytesAllocated = 0;\n  private _numBytesFree = 0; // How many bytes that have been allocated\n                                // are available for reuse.\n  private freeTextures: {[shape: string]: WebGLTexture[]} = {};\n  private logEnabled = false;\n  private usedTextures: {[shape: string]: WebGLTexture[]} = {};\n\n  constructor(private gpgpu: GPGPUContext) {\n\n    acquireTexture(\n      shapeRC: [number, number],\n      usage: TextureUsage,\n      isPacked: boolean): WebGLTexture {\n      const physicalTexType = getPhysicalFromLogicalTextureType(usage, isPacked);\n\n      const shapeKey = getKeyFromTextureShape(shapeRC, physicalTexType, isPacked);\n      if (!(shapeKey in this.freeTextures)) {\n        this.freeTextures[shapeKey] = [];\n      }\n      if (!(shapeKey in this.usedTextures)) {\n        this.usedTextures[shapeKey] = [];\n      }\n\n      const texBytes = computeBytes(\n        shapeRC, physicalTexType, this.gpgpu.gl, this.gpgpu.textureConfig,\n        isPacked);\n\n      if (this.freeTextures[shapeKey].length > 0) {\n        this.numFreeTextures--;\n        this.numUsedTextures++;\n        this._numBytesFree -= texBytes;\n        this.log();\n        const newTexture = this.freeTextures[shapeKey].shift();\n        this.usedTextures[shapeKey].push(newTexture);\n        return newTexture;\n      }\n\n      let newTexture: WebGLTexture;\n      if (physicalTexType === PhysicalTextureType.PACKED_2X2_FLOAT32) {\n        newTexture = this.gpgpu.createPackedMatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (physicalTexType === PhysicalTextureType.PACKED_2X2_FLOAT16) {\n        newTexture =\n        this.gpgpu.createFloat16PackedMatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (physicalTexType === PhysicalTextureType.UNPACKED_FLOAT32) {\n        newTexture =\n        this.gpgpu.createFloat32MatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (physicalTexType === PhysicalTextureType.UNPACKED_FLOAT16) {\n        newTexture =\n        this.gpgpu.createFloat16MatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (\n        physicalTexType === PhysicalTextureType.PACKED_4X1_UNSIGNED_BYTE) {\n        newTexture =\n        this.gpgpu.createUnsignedBytesMatrixTexture(shapeRC[0], shapeRC[1]);\n      }\n\n      this.usedTextures[shapeKey].push(newTexture);\n      this.numUsedTextures++;\n      this._numBytesAllocated += texBytes;\n      this.log();\n      return newTexture;\n    }\n\n    releaseTexture(\n      texture: WebGLTexture, shape: [number, number],\n      logicalTexType: TextureUsage, isPacked: boolean): void {\n      if (this.freeTextures == null) {\n        // Already disposed.\n        return;\n      }\n      const physicalTexType =\n        getPhysicalFromLogicalTextureType(logicalTexType, isPacked);\n      const shapeKey =\n        getKeyFromTextureShape(shape, physicalTexType, isPacked);\n      if (!(shapeKey in this.freeTextures)) {\n        this.freeTextures[shapeKey] = [];\n      }\n\n      const texBytes = computeBytes(\n        shape, physicalTexType, this.gpgpu.gl, this.gpgpu.textureConfig,\n        isPacked);\n      const deleteTexThreshold = env().get('WEBGL_DELETE_TEXTURE_THRESHOLD');\n      if (deleteTexThreshold !== -1 &&\n        this._numBytesAllocated > deleteTexThreshold) {\n        this.gpgpu.deleteMatrixTexture(texture);\n      }\n    }\n  }\n}

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this._numBytesAllocated -= texBytes;\n  } else {\n    this.freeTextures[shapeKey].push(texture);\n    this.numFreeTextures++;\n    this._numBytesFree += texBytes;\n  }\n  this.numUsedTextures--;\n  const\n  texList = this.usedTextures[shapeKey];\n  const texIndex = texList.indexOf(texture);\n  if (texIndex < 0) {\n    throw new Error(\n      'Cannot release a texture that was never provided by this '\n      'texture manager');\n  }\n  texList.splice(texIndex, 1);\n  this.log();\n  private log() {\n    if (!this.logEnabled) {\n      return;\n    }\n    const total = this.numFreeTextures + this.numUsedTextures;\n    console.log(\n      'Free/Used',\n      `${this.numFreeTextures} / ${this.numUsedTextures}`, \n      `(${total})`);\n    const freeRatio =\n    this._numBytesFree / this._numBytesAllocated;\n    console.log(`Bytes allocated: ${this._numBytesAllocated}`);\n    console.log(`Bytes unused: ${this._numBytesFree} (${Math.round(100 * freeRatio)}%)`);\n  }\n  get\n  numBytesAllocated(): number {\n    return this._numBytesAllocated;\n  }\n  get numBytesFree(): number {\n    return this._numBytesFree;\n  }\n  getNumUsedTextures(): number {\n    return this.numUsedTextures;\n  }\n  getNumFreeTextures(): number {\n    return this.numFreeTextures;\n  }\n  dispose() {\n    if (this.freeTextures ===\n    null) {\n      // Already disposed.\n      return;\n    }\n    for (const texShape in this.freeTextures) {\n      this.freeTextures[texShape].forEach(tex => {\n        this.gpgpu.deleteMatrixTexture(tex);\n      });\n    }\n    for\n    (const texShape in this.usedTextures) {\n      this.usedTextures[texShape].forEach(tex => {\n        this.gpgpu.deleteMatrixTexture(tex);\n      });\n    }\n    this.freeTextures = null;\n    this.usedTextures = null;\n    this.numUsedTextures = 0;\n    this.numFreeTextures = 0;\n    this._numBytesAllocated = 0;\n    this._numBytesFree = 0;\n  }\n}\n\nfunction numBytesForInternalFormat(\n  gl: WebGLRenderingContext,\n  internalFormat: number): number {\n  // tslint:disable-next-line:no-any\n  const glany = gl as any;\n  if\n  (internalFormat === glany.R32F) {\n    return 4;\n  } else if (internalFormat === glany.R16F) {\n    return 2;\n  }\n  else if (internalFormat === glany.RGBA32F) {\n    return 16;\n  } else if (internalFormat === gl.RGBA) {\n    return 16;\n  } else if (internalFormat === glany.RGBA16F) {\n    return 8;\n  }\n  throw new Error(`Unknown\n  internal format ${internalFormat}`);\n}\n\nexport function computeBytes(\n  shape: [number, number],\n  physicalTexType: PhysicalTextureType,\n  gl: WebGLRenderingContext, textureConfig: TextureConfig,\n  isPacked: boolean): number {\n  // It is not possible to infer packed status from the texture type because\n  // depending on the textureConfig, different texture types may resolve to the\n  // same internal format (e.g. in\n  WebGL1, the internal format for\n  // UNPACKED_FLOAT16 textures is gl.RGBA). Therefore we pass in\n  `isPacked`\n  // explicitly.\n  const internalFormat =\n    internalFormatForPhysicalTexType(physicalTexType,\n    textureConfig);\n  let numElements: number;\n  if (isPacked) {\n    const [packedWidth, packedHeight] =\n    getPackedMatrixTextureShapeWidthHeight(shape[0], shape[1]);\n    numElements = packedWidth *\n    packedHeight;\n  } else {\n    const [width, height] =\n    getUnpackedMatrixTextureShapeWidthHeight(shape[0], shape[1]);\n    numElements = width * height;\n  }\n  const bytesPerElement = numBytesForInternalFormat(gl, internalFormat);\n  return numElements *\n  bytesPerElement;\n}\n\nfunction internalFormatForPhysicalTexType(\n  physicalTexType:\n  PhysicalTextureType,\n  textureConfig: TextureConfig): number {\n  switch (physicalTexType) {\n    case\n    PhysicalTextureType.PACKED_2X2_FLOAT32:\n      return\n      getInternalFormatForPackedMatrixTexture(textureConfig);\n    case\n    PhysicalTextureType.PACKED_2X2_FLOAT16:\n      return\n      getInternalFormatForFloat16PackedMatrixTexture(textureConfig);\n    case\n    PhysicalTextureType.UNPACKED_FLOAT32:\n      return\n      getInternalFormatForFloat32MatrixTexture(textureConfig);\n    case\n    PhysicalTextureType.UNPACKED_FLOAT16:\n      return\n      getInternalFormatForFloat16MatrixTexture(textureConfig);\n    case\n    PhysicalTextureType.PACKED_4X1_UNSIGNED_BYTE:\n      return\n      getInternalFormatForUnsignedBytesMatrixTexture(textureConfig);\n    default:\n      throw new Error(`Unknown\n      physical texture type ${physicalTexType}`);\n  }\n}\n\nfunction getPhysicalTextureForRendering(isPacked:\n  boolean):\n  PhysicalTextureType {\n  if (env().getBool('WEBGL_RENDER_FLOAT32_ENABLED')) {\n    if\n    (isPacked) {\n      return PhysicalTextureType.PACKED_2X2_FLOAT32;\n    }\n    return

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PhysicalTextureType.UNPACKED_FLOAT32;\n }\n\n if (isPacked) {\n  return
PhysicalTextureType.PACKED_2X2_FLOAT16;\n }\n return
PhysicalTextureType.UNPACKED_FLOAT16;\n}\n\nfunction getPhysicalFromLogicalTextureType(\n
logicalTexType: TextureUsage, isPacked: boolean): PhysicalTextureType {\n  if (logicalTexType ===
TextureUsage.UPLOAD) {\n  return PhysicalTextureType.PACKED_2X2_FLOAT32;\n  } else if (logicalTexType
=== TextureUsage.RENDER || logicalTexType == null) {\n  return getPhysicalTextureForRendering(isPacked);\n
} else if (\n  logicalTexType === TextureUsage.DOWNLOAD ||\n  logicalTexType ===
TextureUsage.PIXELS) {\n  return PhysicalTextureType.PACKED_4X1_UNSIGNED_BYTE;\n  }\n  throw new
Error(`Unknown logical texture type ${logicalTexType}`);\n}\n\nfunction getKeyFromTextureShape(\n
shapeRowsCol: [number, number], physicalTexType: PhysicalTextureType,\n  isPacked: boolean): string {\n
return `${shapeRowsCol[0]}_${shapeRowsCol[1]}_${physicalTexType}_${isPacked}`;\n}\n\n"/**\n * @license\n
* Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
`License`);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an `AS IS` BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class UnaryOpProgram implements
GPGPUProgram {\n  variableNames = ['A'];\n  userCode: string;\n  outputShape: number[];\n\n  constructor(aShape: number[], opSnippet: string) {\n    this.outputShape = aShape;\n    this.userCode = `\n    float
unaryOperation(float x) {\n      ${opSnippet}\n    }\n\n    void main() {\n      float x = getAAAtOutCoords();\n
float y = unaryOperation(x);\n      setOutput(y);\n    }\n  `;\n  }\n}\n\nexport const CHECK_NAN_SNIPPET =
`\nif (isnan(x)) return x;`\n\nexport const LINEAR = `return x;`\n\nexport const ABS = `return abs(x);`\n\nexport
function STEP(alpha = 0.0) {\n  return CHECK_NAN_SNIPPET + `\n  return x > 0.0 ? 1.0 : float(${alpha});\n
`;\n}\n\nexport const ELU = `return (x >= 0.0) ? x : (exp(x) - 1.0);`\n\nexport const RELU =
CHECK_NAN_SNIPPET + `\n  return (x < 0.0) ? 0.0 : x;`\n\nexport const RELU6 = CHECK_NAN_SNIPPET +
`\n  return (x < 0.0) ? 0.0 : min(6.0, x);`\n\nexport const CLONE = `return x;`\n\n"/**\n * @license\n
* Copyright
2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the `License`);\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport const LINEAR = `return x;`\n\nexport const ELU
= `\n  vec4 result;\n\n  result.r = (x.r >= 0.0) ? x.r : (exp(x.r) - 1.0);\n  result.g = (x.g >= 0.0) ? x.g : (exp(x.g) -
1.0);\n  result.b = (x.b >= 0.0) ? x.b : (exp(x.b) - 1.0);\n  result.a = (x.a >= 0.0) ? x.a : (exp(x.a) - 1.0);\n
return
result;\n`;\n\nexport const RELU = `\n  vec4 result = x * vec4(greaterThanEqual(x, vec4(0.0))); \n  bvec4 isNaN =
isnan(x);\n  result.r = isNaN.r ? x.r : result.r;\n  result.g = isNaN.g ? x.g : result.g;\n  result.b = isNaN.b ? x.b :
result.b;\n  result.a = isNaN.a ? x.a : result.a;\n  return result;\n`;\n\nexport const RELU6 = `\n  vec4 result =
min(x, vec4(6.)) * vec4(greaterThanEqual(x, vec4(0.0))); \n  bvec4 isNaN = isnan(x);\n  result.r = isNaN.r ? x.r :
result.r;\n  result.g = isNaN.g ? x.g : result.g;\n  result.b = isNaN.b ? x.b : result.b;\n  result.a = isNaN.a ? x.a :
result.a;\n  return result;\n`;\n\nexport class UnaryOpPackedProgram implements GPGPUProgram {\n
  variableNames = ['A'];\n  userCode: string;\n  outputShape: number[];\n  packedInputs = true;\n  packedOutput =
true;\n\n  constructor(aShape: number[], opSnippet: string) {\n    this.outputShape = aShape;\n    this.userCode = `\n
    vec4 unaryOperation(vec4 x) {\n      ${opSnippet}\n    }\n\n    void main() {\n      vec4 x =
getAAAtOutCoords();\n      vec4 y = unaryOperation(x);\n      setOutput(y);\n    }\n  `;\n  }\n}\n\n"/**\n *

```

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=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels, getSourceCoords} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class UnpackProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  packedInputs = true;\n  packedOutput = false;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(outputShape: number[]) {\n    this.outputShape = outputShape;\n    const rank = outputShape.length;\n    const channels = getChannels('rc', rank);\n    const dtype = getCoordsDataType(rank);\n    const sourceCoords = getSourceCoords(rank, channels);\n    const innerDims = channels.slice(-2);\n    const coords = rank <= 1 ? 'rc' : `vec2(${innerDims.join(',')})`;\n    this.userCode =`\nvoid main() {\n  ${dtype} rc = getOutputCoords();\n  vec4 packedInput = getA(${sourceCoords});\n  setOutput(getChannel(packedInput, ${coords}));\n}`;\n  }\n}\n\n\"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\n\n// Import WebGL flags.\nimport './flags_webgl';\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport {backend_util, BackendValues, buffer, DataId, DataStorage, DataType, DataValues, engine, env, kernel_impls, KernelBackend, MemoryInfo, NumericDataType, Rank, RecursiveArray, scalar, ShapeMap, Tensor, Tensor2D, TensorBuffer, TensorInfo, tidy, TimingInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {getWebGLContext} from './canvas_util';\nimport {DecodeMatrixProgram} from './decode_matrix_gpu';\nimport {DecodeMatrixPackedProgram} from './decode_matrix_packed_gpu';\nimport {EncodeFloatProgram} from './encode_float_gpu';\nimport {EncodeFloatPackedProgram} from './encode_float_packed_gpu';\nimport {EncodeMatrixProgram} from './encode_matrix_gpu';\nimport {EncodeMatrixPackedProgram} from './encode_matrix_packed_gpu';\nimport {GPGPUContext} from './gpgpu_context';\nimport * as gpgpu_math from './gpgpu_math';\nimport {GPGPUBinary, GPGPUProgram, TensorData} from './gpgpu_math';\nimport {simpleAbsImplCPU} from './kernel_utils/shared';\nimport {PackProgram} from './pack_gpu';\nimport {ReshapePackedProgram} from './reshape_packed_gpu';\nimport * as tex_util from './tex_util';\nimport {TextureData, TextureUsage} from './tex_util';\nimport {TextureManager} from './texture_manager';\nimport * as unary_op from './unaryop_gpu';\nimport {UnaryOpProgram} from './unaryop_gpu';\nimport {UnaryOpPackedProgram} from './unaryop_packed_gpu';\nimport {UnpackProgram} from './unpack_gpu';\nimport * as webgl_util from './webgl_util';\n\nconst whereImpl = kernel_impls.whereImpl;\n\nexport const EPSILON_FLOAT32 = 1e-7;\nexport const EPSILON_FLOAT16 = 1e-4;\n\nexport type KernelInfo = {\n  name: string;\n  query: Promise<number>;\n};\n\nexport type TimerNode = RecursiveArray<KernelInfo>|KernelInfo;\n\nexport interface CPUQuery {\n  startMs: number;\n  endMs?: number;\n}\n\nexport interface WebGLMemoryInfo extends MemoryInfo {\n  numBytesInGPU: number;\n  // Tracks the total number of bytes allocated on the GPU, accounting for the\n  // physical texture type.\n  numBytesInGPUAllocated: number;\n  // Tracks byte size of textures that were created and then made available for\n  // reuse (disposed).\n  numBytesInGPUFree: number;\n  unreliable: boolean;\n}\n\nexport interface WebGLTimingInfo extends TimingInfo {\n  uploadWaitMs: number;\n  downloadWaitMs: number;\n}\n\nconst binaryCaches: {[webGLVersion: string]: {[key: string]: GPGPUBinary}} = {};\n\nexport function getBinaryCache(webGLVersion: number) {\n  if (webGLVersion in binaryCaches) {\n
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return binaryCaches[webGLVersion];\n } \n binaryCaches[webGLVersion] = {};\n return
binaryCaches[webGLVersion];\n }\n\n// Empirically determined constant used to determine size threshold for
handling\n// off execution to the CPU.\nconst CPU_HANDOFF_SIZE_THRESHOLD = 128;\n\n// Empirically
determined constant used to decide the number of MB on GPU\n// before we warn about high memory use. The MB
are this constant * screen area\n// * dpi / 1024 / 1024.\nconst BEFORE_PAGING_CONSTANT = 600;\nfunction
numMBBeforeWarning(): number {\n if (env().global.screen == null) {\n return 1024; // 1 GB.\n }\n return
(env().global.screen.height * env().global.screen.width *\n window.devicePixelRatio) *\n
BEFORE_PAGING_CONSTANT / 1024 / 1024;\n }\n\nexport class MathBackendWebGL extends KernelBackend
{\n texData: DataStorage<TextureData>;\n gpgpu: GPGPUContext;\n\n private static nextDataId = 0;\n private
nextDataId(): number {\n return MathBackendWebGL.nextDataId++;\n }\n // Maps data ids that have a pending
read operation, to list of subscribers.\n private pendingRead = new WeakMap<DataId, Array<(arr: TypedArray) =>
void>>();\n // List of data ids that are scheduled for disposal, but are waiting on a\n // pending read operation.\n
private pendingDisposal = new WeakSet<DataId>();\n\n // Used to count the number of 'shallow' sliced tensors that
point to the\n // same data id.\n dataRefCount = new WeakMap<DataId, number>();\n private numBytesInGPU =
0;\n\n private canvas: HTMLCanvasElement|OffscreenCanvas;\n\n private programTimersStack: TimerNode[];\n
private activeTimers: TimerNode[];\n // Accumulated time spent (including blocking) in uploading data to webgl.\n
private uploadWaitMs = 0;\n // Accumulated time spent (including blocking in downloading data from webgl.\n
private downloadWaitMs = 0;\n private cpuBackend: KernelBackend;\n\n // Number of bits of precision of this
backend.\n private floatPrecisionValue: 32|16;\n\n private textureManager: TextureManager;\n private
binaryCache: {[key: string]: GPGPUBinary};\n private gpgpuCreatedLocally: boolean;\n private
numMBBeforeWarning: number;\n private warnedAboutMemory = false;\n private warnedAboutCPUBackend =
false;\n\n constructor(gpgpu?: GPGPUContext) {\n super();\n if (!env().getBool('HAS_WEBGL')) {\n throw
new Error('WebGL is not supported on this device');\n }\n\n if (gpgpu == null) {\n const gl =
getWebGLContext(env().getNumber('WEBGL_VERSION'));\n this.binaryCache =
getBinaryCache(env().getNumber('WEBGL_VERSION'));\n this.gpgpu = new GPGPUContext(gl);\n
this.canvas = gl.canvas;\n this.gpgpuCreatedLocally = true;\n } else {\n this.gpgpu = gpgpu;\n
this.binaryCache = {};\n this.gpgpuCreatedLocally = false;\n this.canvas = gpgpu.gl.canvas;\n }\n
this.textureManager = new TextureManager(this.gpgpu);\n this.numMBBeforeWarning =
numMBBeforeWarning();\n\n this.texData = new DataStorage(this, engine());\n }\n\n numDataIds() {\n return
this.texData.numDataIds() +\n (this.cpuBackend ? this.cpuBackend.numDataIds() : 0) -\n
this.pendingDeletes;\n }\n\n write(values: BackendValues, shape: number[], dtype: DataType): DataId {\n if
(env().getBool('WEBGL_CHECK_NUMERICAL_PROBLEMS') ||\n env().getBool('DEBUG')) {\n
this.checkNumericalProblems(values);\n }\n if (dtype === 'complex64' && values != null) {\n throw new
Error(\n `Cannot write to a complex64 dtype. ` +\n `Please use tf.complex(real, imag).`);\n }\n const
dataId = {id: this.nextDataId()};\n this.texData.set(\n dataId,\n {shape, dtype, values, usage:
TextureUsage.UPLOAD, refCount: 1});\n return dataId;\n }\n\n /** Return refCount of a `TensorData`. */\n
refCount(dataId: DataId): number {\n if (this.texData.has(dataId)) {\n const tensorData =
this.texData.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n\n /** Increase refCount of a
`TextureData`. */\n incRef(dataId: DataId): void {\n const texData = this.texData.get(dataId);\n
texData.refCount++;\n }\n\n /** Decrease refCount of a `TextureData`. */\n decRef(dataId: DataId): void {\n if
(this.texData.has(dataId)) {\n const texData = this.texData.get(dataId);\n texData.refCount--;\n }\n }\n\n
move(\n dataId: DataId, values: BackendValues, shape: number[], dtype: DataType,\n refCount: number):
void {\n if (env().getBool('DEBUG')) {\n this.checkNumericalProblems(values);\n }\n if (dtype ===
'complex64') {\n throw new Error(\n `Cannot write to a complex64 dtype. ` +\n `Please use
tf.complex(real, imag).`);\n }\n this.texData.set(\n dataId, {shape, dtype, values, usage:
TextureUsage.UPLOAD, refCount});\n }\n\n disposeIntermediateTensorInfo(tensorInfo: TensorInfo): void {\n
this.disposeData(tensorInfo.dataId);\n }\n\n readSync(dataId: DataId): BackendValues {\n const texData =
this.texData.get(dataId);\n const {values, dtype, complexTensorInfos, slice, shape, isPacked} = texData;\n\n //

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The presence of `slice` indicates this tensor is a shallow slice of a\n // different tensor, and is using that original
tensor's texture. Run\n // `clone` in order to copy that texture and read from it.\n if (slice != null) {\n let
program;\n if (isPacked) {\n program = new UnaryOpPackedProgram(shape, unary_op.CLONE);\n } else
{\n program = new UnaryOpProgram(shape, unary_op.CLONE);\n }\n const res =\n this.runWebGLProgram(program, [{dataId, shape, dtype}], dtype);\n const data = this.readSync(res.dataId);\n
this.disposeIntermediateTensorInfo(res);\n return data;\n }\n if (values != null) {\n return
this.convertAndCacheOnCPU(dataId);\n }\n if (dtype === 'string') {\n return values;\n }\n const
shouldTimeProgram = this.activeTimers != null;\n let start: number;\n if (shouldTimeProgram) {\n start =
util.now();\n }\n\n let result: Float32Array;\n if (dtype === 'complex64') {\n const realValues =\n
this.readSync(complexTensorInfos.real.dataId) as Float32Array;\n const imagValues =\n
this.readSync(complexTensorInfos.imag.dataId) as Float32Array;\n result =
backend_util.mergeRealAndImagArrays(realValues, imagValues);\n } else {\n result =
this.getValuesFromTexture(dataId);\n }\n\n if (shouldTimeProgram) {\n this.downloadWaitMs += util.now()
- start;\n }\n return this.convertAndCacheOnCPU(dataId, result);\n }\n\n async read(dataId: DataId):
Promise<BackendValues> {\n if (this.pendingRead.has(dataId)) {\n const subscribers =
this.pendingRead.get(dataId);\n return new Promise<TypedArray>(resolve => subscribers.push(resolve));\n }
\n const texData = this.texData.get(dataId);\n const {values, shape, slice, dtype, complexTensorInfos, isPacked} =
texData;\n\n // The presence of `slice` indicates this tensor is a shallow slice of a\n // different tensor, and is
using that original tensor's texture. Run\n // `clone` in order to copy that texture and read from it.\n if (slice !=
null) {\n let program;\n if (isPacked) {\n program = new UnaryOpPackedProgram(shape,
unary_op.CLONE);\n } else {\n program = new UnaryOpProgram(shape, unary_op.CLONE);\n }\n\n
const res =\n this.runWebGLProgram(program, [{dataId, shape, dtype}], dtype);\n const data =
this.read(res.dataId);\n this.disposeIntermediateTensorInfo(res);\n return data;\n }\n\n if (values != null)
{\n return this.convertAndCacheOnCPU(dataId);\n }\n\n if
(!env().getBool('WEBGL_DOWNLOAD_FLOAT_ENABLED') &&\n
env().getNumber('WEBGL_VERSION') === 2) {\n throw new Error(\n `tensor.data() with
WEBGL_DOWNLOAD_FLOAT_ENABLED=false and `+\n `WEBGL_VERSION=2 not yet supported.`);\n
}\n\n let buffer = null;\n let tmpDownloadTarget: TensorInfo;\n\n if (dtype !== 'complex64' &&
env().get('WEBGL_BUFFER_SUPPORTED')) {\n // Possibly copy the texture into a buffer before inserting a
fence.\n tmpDownloadTarget = this.decode(dataId);\n const tmpData =
this.texData.get(tmpDownloadTarget.dataId);\n\n buffer = this.gpgpu.createBufferFromTexture(\n
tmpData.texture, ...tex_util.getDenseTexShape(shape));\n }\n\n this.pendingRead.set(dataId, []);\n\n if (dtype
!== 'complex64') {\n // Create a fence and wait for it to resolve.\n await
this.gpgpu.createAndWaitForFence();\n }\n\n // Download the values from the GPU.\n let vals:
Float32Array;\n if (dtype === 'complex64') {\n const ps = await Promise.all([\n
this.read(complexTensorInfos.real.dataId),\n this.read(complexTensorInfos.imag.dataId)\n ]);\n\n const
realValues = ps[0];\n const imagValues = ps[1];\n vals = backend_util.mergeRealAndImagArrays(\n
realValues as Float32Array, imagValues as Float32Array);\n } else if (buffer == null) {\n vals =
this.getValuesFromTexture(dataId);\n } else {\n const size = util.sizeFromShape(shape);\n vals =
this.gpgpu.downloadFloat32MatrixFromBuffer(buffer, size);\n }\n\n if (tmpDownloadTarget != null) {\n
this.disposeIntermediateTensorInfo(tmpDownloadTarget);\n }\n\n const dTypeVals =
this.convertAndCacheOnCPU(dataId, vals);\n\n const subscribers = this.pendingRead.get(dataId);\n
this.pendingRead.delete(dataId);\n\n // Notify all pending reads.\n subscribers.forEach(resolve =>
resolve(dTypeVals));\n if (this.pendingDisposal.has(dataId)) {\n this.pendingDisposal.delete(dataId);\n
if (this.disposeData(dataId)) {\n engine().removeDataId(dataId, this);\n }\n this.pendingDeletes--;\n }\n
return dTypeVals;\n }\n\n bufferSync<R extends Rank>(t: TensorInfo): TensorBuffer<R> {\n const data =
this.readSync(t.dataId);\n let decodedData = data as DataValues;\n if (t.dtype === 'string') {\n try {\n //
Decode the bytes into string.\n decodedData = (data as Uint8Array[]).map(d => util.decodeString(d));\n }

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catch {\n    throw new Error('Failed to decode encoded string bytes into utf-8');\n    }\n }\n return
buffer(t.shape as ShapeMap[R], t.dtype, decodedData) as\n    TensorBuffer<R>;\n }\n\n private
checkNumericalProblems(values: BackendValues): void {\n    if (values == null) {\n        return;\n    }\n    for (let i =
0; i < values.length; i++) {\n        const num = values[i] as number;\n        if (!webgl_util.canBeRepresented(num)) {\n            if (env().getBool('WEBGL_RENDER_FLOAT32_CAPABLE')) {\n                throw Error(\n                    `The value
${num} cannot be represented with your ` +\n                    `current settings. Consider enabling float32 rendering: ` +\n                    `tf.env().set('WEBGL_RENDER_FLOAT32_ENABLED', true);`);\n            }\n            throw Error(`The value
${num} cannot be represented on this device.`);\n        }\n    }\n }\n\n private
getValuesFromTexture(dataId:
DataId): Float32Array {\n    const {shape, dtype, isPacked} = this.texData.get(dataId);\n    const size =
util.sizeFromShape(shape);\n    if (env().getBool('WEBGL_DOWNLOAD_FLOAT_ENABLED')) {\n        const
tmpTarget = this.decode(dataId);\n        const tmpData = this.texData.get(tmpTarget.dataId);\n        const vals =
this.gpgpu\n            .downloadMatrixFromPackedTexture(\n                tmpData.texture,
...tex_util.getDenseTexShape(shape))\n                .subarray(0, size);\n\n        this.disposeIntermediateTensorInfo(tmpTarget);\n        return vals;\n    }\n\n    const shouldUsePackedProgram =\n        env().getBool('WEBGL_PACK') && isPacked === true;\n    const outputShape =\n        shouldUsePackedProgram ? webgl_util.getShapeAs3D(shape) : shape;\n    const program =
        shouldUsePackedProgram ?\n            new EncodeFloatPackedProgram(outputShape as [number, number, number]) :\n            new EncodeFloatProgram(outputShape);\n    const output = this.runWebGLProgram(\n        program, [{shape:
outputShape, dtype, dataId}], 'float32');\n    const tmpData = this.texData.get(output.dataId);\n    const vals =\n        this.gpgpu\n            .downloadByteEncodedFloatMatrixFromOutputTexture(\n                tmpData.texture,
tmpData.texShape[0], tmpData.texShape[1])\n                .subarray(0, size);\n\n    this.disposeIntermediateTensorInfo(output);\n    return vals;\n }\n\n timerAvailable(): boolean {\n    return
env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0;\n }\n\n async time(f:
() => void): Promise<WebGLTimingInfo> {\n    const oldActiveTimers = this.activeTimers;\n    const
newActiveTimers: TimerNode[] = [];\n\n    let outerMostTime = false;\n    if (this.programTimersStack == null) {\n        this.programTimersStack = newActiveTimers;\n        outerMostTime = true;\n    } else {\n        this.activeTimers.push(newActiveTimers);\n    }\n    this.activeTimers = newActiveTimers;\n\n    f();\n\n    //
needing to split these up because util.flatten only accepts certain types\n    const flattenedActiveTimerQueries =\n        util.flatten(this.activeTimers.map((d: KernelInfo) => d.query))\n            .filter(d => d != null);\n    const
flattenedActiveTimerNames =\n        util.flatten(this.activeTimers.map((d: KernelInfo) => d.name))\n            .filter(d
=> d != null);\n\n    this.activeTimers = oldActiveTimers;\n\n    if (outerMostTime) {\n        this.programTimersStack
= null;\n    }\n\n    const res: WebGLTimingInfo = {\n        uploadWaitMs: this.uploadWaitMs,\n        downloadWaitMs: this.downloadWaitMs,\n        kernelMs: null,\n        wallMs: null // will be filled by the engine\n    };\n\n    if (env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n        const kernelMs = await Promise.all(flattenedActiveTimerQueries);\n        res['kernelMs'] = util.sum(kernelMs);\n        res['getExtraProfileInfo'] = () =>\n            kernelMs.map((d, i) => ({name: flattenedActiveTimerNames[i], ms: d}))\n                .map(d => `${d.name}: ${d.ms}`)\n                .join(', ');\n    } else {\n        res['kernelMs'] = {\n            error:
'WebGL query timers are not supported in this environment.\n        ';\n    }\n\n    this.uploadWaitMs = 0;\n    this.downloadWaitMs = 0;\n    return res;\n }\n\n memory(): WebGLMemoryInfo {\n    return {\n        unreliable:
false,\n        numBytesInGPU: this.numBytesInGPU,\n        numBytesInGPUAllocated:
this.textureManager.numBytesAllocated,\n        numBytesInGPUFree: this.textureManager.numBytesFree\n    } as
WebGLMemoryInfo;\n }\n\n private startTimer(): WebGLQuery|CPUTimerQuery {\n    if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n        return
this.gpgpu.beginQuery();\n    }\n    return {startMs: util.now(), endMs: null};\n }\n\n private endTimer(query:
WebGLQuery|CPUTimerQuery): WebGLQuery|CPUTimerQuery {\n    if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n        this.gpgpu.endQuery();\n        return query;\n    }\n    (query as CPUTimerQuery).endMs = util.now();\n    return
query;\n }\n\n private async getQueryTime(query: WebGLQuery|CPUTimerQuery): Promise<number> {\n    if

```

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(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n  return
this.gpgpu.waitForQueryAndGetTime(query as WebGLQuery);\n }\n const timerQuery = query as
CPUQuery;\n return timerQuery.endMs - timerQuery.startMs;\n }\n\n private pendingDeletes = 0;\n\n /**\n * Decrease the RefCount on the dataId and dispose the memory if the dataId\n * has 0 refCount. If there are
pending read on the data, the disposal would\n * added to the pending delete queue. Return true if the dataId is
removed\n * from backend or the backend does not contain the dataId, false if the\n * dataId is not removed.
Memory may or may not be released even when dataId\n * is removed, which also depends on dataRefCount, see
`releaseGPU`.\n * @param dataId\n * @param force Optional, remove the data regardless of refCount\n */\n
disposeData(dataId: DataId, force = false): boolean {\n  if (this.pendingDisposal.has(dataId)) {\n    return false;\n
}\n\n // No-op if already disposed.\n if (!this.texData.has(dataId)) {\n    return true;\n }\n\n // if force flag is
set, change refCount to 0, this would ensure disposal\n // when added to the pendingDisposal queue. Memory may
or may not be\n // released, which also depends on dataRefCount, see `releaseGPU`.\n if (force) {\n
this.texData.get(dataId).refCount = 0;\n } else {\n    this.texData.get(dataId).refCount--;\n }\n\n if (!force &&
this.texData.get(dataId).refCount > 0) {\n    return false;\n }\n\n if (this.pendingRead.has(dataId)) {\n
this.pendingDisposal.add(dataId);\n    this.pendingDeletes++;\n    return false;\n }\n\n
this.releaseGPUData(dataId);\n const {complexTensorInfos} = this.texData.get(dataId);\n if
(complexTensorInfos != null) {\n    this.disposeData(complexTensorInfos.real.dataId, force);\n
this.disposeData(complexTensorInfos.imag.dataId, force);\n }\n\n this.texData.delete(dataId);\n\n return
true;\n }\n\n private releaseGPUData(dataId: DataId): void {\n  const {texture, dtype, texShape, usage, isPacked,
slice} =\n    this.texData.get(dataId);\n  const key = slice && slice.origDataId || dataId;\n  const refCount =
this.dataRefCount.get(key);\n  if (refCount > 1) {\n    this.dataRefCount.set(key, refCount - 1);\n  } else {\n
this.dataRefCount.delete(key);\n    if (texture != null) {\n      this.numBytesInGPU -=
this.computeBytes(texShape, dtype);\n      this.textureManager.releaseTexture(texture, texShape, usage,
isPacked);\n    }\n  }\n\n const texData = this.texData.get(dataId);\n  texData.texture = null;\n
texData.texShape = null;\n  texData.isPacked = false;\n  texData.slice = null;\n }\n\n getTexture(dataId: DataId):
WebGLTexture {\n  this.uploadToGPU(dataId);\n  return this.texData.get(dataId).texture;\n }\n\n /**\n *
Returns internal information for the specific data bucket. Used in unit\n * tests.\n */\n getDataInfo(dataId:
DataId): TextureData {\n  return this.texData.get(dataId);\n }\n\n private getCPUBackend(): KernelBackend|null
{\n  if (!env().getBool('WEBGL_CPU_FORWARD')) {\n    return null;\n }\n\n if (this.cpuBackend == null) {\n
this.cpuBackend = engine().findBackend('cpu');\n }\n\n return this.cpuBackend;\n }\n\n /**\n Tests
whether all the inputs to an op are small and on the CPU. This heuristic\n determines when it would be faster to
execute a kernel on the CPU. WebGL\n kernels opt into running this check and forwarding when appropriate.\n
TODO(https://github.com/tensorflow/tfjs/issues/872): Develop a more\n sustainable strategy for optimizing
backend execution of ops.\n */\n shouldExecuteOnCPU(\n  inputs: TensorInfo[],\n  sizeThreshold =
CPU_HANDOFF_SIZE_THRESHOLD): boolean {\n  const cpuBackend = this.getCPUBackend();\n  if
(!env().getBool('IS_TEST') && !this.warnedAboutCPUBackend &&\n    cpuBackend == null) {\n
console.warn(\n    'Your application contains ops that are small enough to be ' +\n    'executed on the CPU
backend, however the CPU backend cannot ' +\n    'be found. Consider importing the CPU backend ' +\n
'(@tensorflow/tfjs-backend-cpu) for better performance.);\n    this.warnedAboutCPUBackend = true;\n }\n\n
return cpuBackend != null &&\n    inputs.every(\n      input => this.texData.get(input.dataId).texture == null
&&\n      util.sizeFromShape(input.shape) < sizeThreshold);\n }\n\n getGPGPUContext(): GPGPUContext
{\n  return this.gpgpu;\n }\n\n where(condition: Tensor): Tensor2D {\n  backend_util.warn(\n    'tf.where()
in webgl locks the UI thread. ' +\n    'Call tf.whereAsync() instead');\n  const condVals = condition.dataSync();\n
return whereImpl(condition.shape, condVals);\n }\n\n private packedUnaryOp(x: TensorInfo, op: string, dtype:
DataType) {\n  const program = new UnaryOpPackedProgram(x.shape, op);\n  const outInfo =
this.compileAndRun(program, [x], dtype);\n  return engine().makeTensorFromDataId(\n    outInfo.dataId,
outInfo.shape, outInfo.dtype);\n }\n\n // TODO(msoulanille) remove this once the backend has been modularized\n
// a copy is needed here to break a circular dependency.\n // Also remove the op from unary_op.\n abs<T extends

```



```

Tensor<(x: T): T {\n // TODO: handle cases when x is complex.\n if (this.shouldExecuteOnCPU([x]) &&
x.dtype !== 'complex64') {\n const outValues =\n simpleAbsImplCPU(this.texData.get(x.dataId).values as
TypedArray);\n return this.makeOutput(x.shape, x.dtype, outValues);\n }\n\n if
(env().getBool('WEBGL_PACK_UNARY_OPERATIONS')) {\n return this.packedUnaryOp(x, unary_op.ABS,
x.dtype) as T;\n }\n\n const program = new UnaryOpProgram(x.shape, unary_op.ABS);\n const outInfo =
this.compileAndRun(program, [x]);\n return engine().makeTensorFromDataId(\n outInfo.dataId,
outInfo.shape, outInfo.dtype) as T;\n }\n\n makeTensorInfo(\n shape: number[], dtype: DataType,\n values?:
BackendValues|string[]): TensorInfo {\n let dataId;\n if (dtype === 'string' && values != null && values.length
> 0 &&\n util.isString(values[0])) {\n const encodedValues =\n (values as {} as string[]).map(d =>
util.encodeString(d));\n dataId = this.write(encodedValues, shape, dtype);\n } else {\n dataId =
this.write(values as TypedArray, shape, dtype);\n }\n\n this.texData.get(dataId).usage = null;\n return {dataId,
shape, dtype};\n }\n\n private makeOutput<T extends Tensor>(\n shape: number[], dtype: DataType, values?:
BackendValues): T {\n const {dataId} = this.makeTensorInfo(shape, dtype, values);\n return
engine().makeTensorFromDataId(dataId, shape, dtype, this) as T;\n }\n\n private unpackTensor(input: TensorInfo):
TensorInfo {\n const program = new UnpackProgram(input.shape);\n return this.runWebGLProgram(program,
[input], input.dtype);\n }\n\n private packTensor(input: TensorInfo): TensorInfo {\n const program = new
PackProgram(input.shape);\n const preventEagerUnpackingOutput = true;\n return this.runWebGLProgram(\n
program, [input], input.dtype, null /* customSetup */,\n preventEagerUnpackingOutput);\n }\n\n private
packedReshape(input: TensorInfo, afterShape: number[]): TensorInfo {\n const input3DShape = [\n
webgl_util.getBatchDim(input.shape),\n ...webgl_util.getRowsCols(input.shape)\n ] as [number, number,
number];\n const input3D: TensorInfo = {\n dtype: input.dtype,\n shape: input3DShape,\n dataId:
input.dataId\n };\n const afterShapeAs3D = [\n webgl_util.getBatchDim(afterShape),
...webgl_util.getRowsCols(afterShape)\n ] as [number, number, number];\n\n const program = new
ReshapePackedProgram(afterShapeAs3D, input3DShape);\n const preventEagerUnpackingOfOutput = true;\n
const output = this.runWebGLProgram(\n program, [input3D], input.dtype, null /* customSetup */,\n
preventEagerUnpackingOfOutput);\n return {dataId: output.dataId, shape: afterShape, dtype: output.dtype};\n
}\n\n private decode(dataId: DataId): TensorInfo {\n const texData = this.texData.get(dataId);\n const
{isPacked, shape, dtype} = texData;\n const shapeAs3D =\n webgl_util.getShapeAs3D(shape) as [number,
number, number];\n let program;\n if (isPacked) {\n program = new
DecodeMatrixPackedProgram(shapeAs3D);\n } else {\n program = new DecodeMatrixProgram(shapeAs3D);\n
}\n\n const preventEagerUnpackingOfOutput = true;\n const out = this.runWebGLProgram(\n program,
[{\n shape: shapeAs3D, dtype, dataId}], dtype,\n null /* customSetup */, preventEagerUnpackingOfOutput);\n
return {dtype, shape, dataId: out.dataId};\n }\n\n runWebGLProgram(\n program: GPGPUProgram, inputs:
TensorInfo[], outputDType: DataType,\n customSetup?: (gpgpu: GPGPUContext, webGLProgram:
WebGLProgram) => void,\n preventEagerUnpackingOfOutput = false): TensorInfo {\n const output =
this.makeTensorInfo(program.outputShape, outputDType);\n const outData = this.texData.get(output.dataId);\n if
(program.packedOutput) {\n outData.isPacked = true;\n }\n\n if (program.outPackingScheme ===
tex_util.PackingScheme.DENSE) {\n const texelShape = tex_util.getDenseTexShape(program.outputShape);\n
// For a densely packed output, we explicitly set texShape\n // so it doesn't get assigned later according to our
typical packing\n // scheme wherein a single texel can only contain values from adjacent\n // rows/cols.\n
outData.texShape = texelShape.map(d => d * 2) as [number, number];\n }\n\n if (program.outTexUsage != null)
{\n outData.usage = program.outTexUsage;\n }\n\n if (util.sizeFromShape(output.shape) === 0) {\n //
Short-circuit the computation since the result is empty (has 0 in its\n // shape).\n outData.values =\n
util.getTypedArrayFromDType(output.dtype as 'float32', 0);\n return output;\n }\n\n const dataToDispose:
TensorInfo[] = [];\n const inputsData: TensorData[] = inputs.map(input => {\n if (input.dtype === 'complex64')
{\n throw new Error(\n `GPGPUProgram does not support complex64 input. For complex64` +\n
`dtypes, please separate the program into real and imaginary` +\n `parts.`);\n }\n\n let texData =
this.texData.get(input.dataId);\n\n if (texData.texture == null) {\n if (!program.packedInputs &&\n

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util.sizeFromShape(input.shape) <= \n      env().getNumber('WEBGL_SIZE_UPLOAD_UNIFORM')) {\n
// Upload small tensors that live on the CPU as uniforms, not as \n      // textures. Do this only when the
environment supports 32bit floats \n      // due to problems when comparing 16bit floats with 32bit floats. \n      //
TODO(https://github.com/tensorflow/tfjs/issues/821): Make it \n      // possible for packed shaders to sample from
uniforms. \n      return {\n      shape: input.shape, \n      texData: null, \n      isUniform: true, \n
uniformValues: texData.values as TypedArray \n      }; \n      } \n      // This ensures that if a packed program's
inputs have not yet been \n      // uploaded to the GPU, they get uploaded as packed right off the bat. \n      if
(program.packedInputs) {\n      texData.isPacked = true; \n      texData.shape = input.shape; \n      } \n      } else
if (!texData.isPacked !== !program.packedInputs) {\n      input = texData.isPacked ? this.unpackTensor(input) : \n
      this.packTensor(input); \n      dataToDispose.push(input); \n      texData =
this.texData.get(input.dataId); \n      } else if (\n      texData.isPacked && \n
!webgl_util.isReshapeFree(texData.shape, input.shape)) {\n      // This is a special case where a texture exists for a
tensor \n      // but the shapes are incompatible (due to packing constraints) because \n      // the tensor did not have
a chance to go through the packed reshape \n      // shader. This only happens when we reshape the *same* tensor to
form \n      // *distinct* inputs to an op, e.g. dotting a vector with itself. This \n      // case will disappear once
packed uploading is the default. \n      \n      const savedInput = input; \n      const targetShape = input.shape; \n
      input.shape = texData.shape; \n      input = this.packedReshape(input as Tensor, targetShape); \n
      dataToDispose.push(input); \n      texData = this.texData.get(input.dataId); \n      \n      savedInput.shape =
targetShape; \n      } \n      \n      this.uploadToGPU(input.dataId); \n      return {shape: input.shape, texData, isUniform:
false}; \n      }); \n      \n      this.uploadToGPU(output.dataId); \n      const outputData: \n      TensorData = {shape:
output.shape, texData: outData, isUniform: false}; \n      const key = gpgpu_math.makeShaderKey(program,
inputsData, outputData); \n      const binary = this.getAndSaveBinary(key, () => {\n      return
gpgpu_math.compileProgram(\n      this.gpgpu, program, inputsData, outputData); \n      }); \n      \n      const
shouldTimeProgram = this.activeTimers !== null; \n      let query: WebGLQuery|CPUTimerQuery; \n      if
(shouldTimeProgram) {\n      query = this.startTimer(); \n      } \n      \n      gpgpu_math.runProgram(\n      this.gpgpu,
binary, inputsData, outputData, customSetup); \n      \n      dataToDispose.forEach(info =>
this.disposeIntermediateTensorInfo(info)); \n      \n      if (shouldTimeProgram) {\n      query = this.endTimer(query); \n
      this.activeTimers.push(\n      {name: program.constructor.name, query: this.getQueryTime(query)}); \n      } \n      \n      if
(!env().getBool('WEBGL_LAZILY_UNPACK') && outData.isPacked && \n      preventEagerUnpackingOfOutput
=== false) {\n      const unpacked = this.unpackTensor(output); \n      this.disposeIntermediateTensorInfo(output); \n
      return unpacked; \n      } \n      return output; \n      } \n      \n      compileAndRun(\n      program: GPGPUProgram, inputs:
TensorInfo[], outputDtype?: DataType, \n      customSetup?: (gpgpu: GPGPUContext, webGLProgram:
WebGLProgram) => void, \n      preventEagerUnpackingOfOutput = false): TensorInfo {\n      outputDtype =
outputDtype || inputs[0].dtype; \n      const outInfo = this.runWebGLProgram(\n      program, inputs, outputDtype,
customSetup, \n      preventEagerUnpackingOfOutput); \n      return outInfo; \n      } \n      \n      private getAndSaveBinary(key:
string, getBinary: () => GPGPUBinary): \n      GPGPUBinary {\n      if (!(key in this.binaryCache)) {\n
      this.binaryCache[key] = getBinary(); \n      } \n      return this.binaryCache[key]; \n      } \n      \n      private getTextureManager():
TextureManager {\n      return this.textureManager; \n      } \n      \n      private disposed = false; \n      \n      dispose() {\n      if
(this.disposed) {\n      return; \n      } \n      // Avoid disposing the compiled webgl programs during unit testing
because \n      // it slows down test execution. \n      if (!env().getBool('IS_TEST')) {\n      const allKeys =
Object.keys(this.binaryCache); \n      allKeys.forEach(key => {\n
      this.gpgpu.deleteProgram(this.binaryCache[key].webGLProgram); \n      delete this.binaryCache[key]; \n      }); \n
      } \n      \n      this.textureManager.dispose(); \n      if (this.canvas !== null && \n      (typeof (HTMLCanvasElement) !==
'undefined' && \n      this.canvas instanceof HTMLCanvasElement)) {\n      this.canvas.remove(); \n      } else {\n
      this.canvas = null; \n      } \n      if (this.gpgpuCreatedLocally) {\n      this.gpgpu.program = null; \n
      this.gpgpu.dispose(); \n      } \n      \n      this.disposed = true; \n      } \n      \n      floatPrecision(): 16|32 {\n      if (this.floatPrecisionValue
=== null) {\n      this.floatPrecisionValue = tidy(() => {\n      if
(!env().get('WEBGL_RENDER_FLOAT32_ENABLED')) {\n      // Momentarily switching DEBUG flag to false

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so we don't throw an\n      // error trying to upload a small value.\n      const debugFlag =
env().getBool('DEBUG');\n      env().set('DEBUG', false);\n      const underflowCheckValue =
this.abs(scalar(1e-8)).dataSync()[0];\n      env().set('DEBUG', debugFlag);\n\n      if (underflowCheckValue >
0) {\n      return 32;\n      }\n      return 16;\n      });\n      return this.floatPrecisionValue;\n      }\n\n      /** Returns the smallest representable number. */\n      epsilon(): number {\n      return this.floatPrecision() === 32 ?
EPSILON_FLOAT32 : EPSILON_FLOAT16;\n      }\n\n      uploadToGPU(dataId: DataId): void {\n      const texData =
this.texData.get(dataId);\n      const {shape, dtype, values, texture, usage, isPacked} = texData;\n\n      if (texture !=
null) {\n      // Array is already on GPU. No-op.\n      return;\n      }\n      const shouldTimeProgram = this.activeTimers
!= null;\n      let start: number;\n      if (shouldTimeProgram) {\n      start = util.now();\n      }\n\n      let texShape =
texData.texShape;\n      if (texShape == null) {\n      texShape =
webgl_util.getTextureShapeFromLogicalShape(shape, isPacked);\n      texData.texShape = texShape;\n      }\n\n      if
(values != null) {\n      const shapeAs3D = webgl_util.getShapeAs3D(shape);\n\n      let program;\n      let width =
texShape[1], height = texShape[0];\n      const isByteArray = values instanceof Uint8Array;\n\n      if (isPacked) {\n
[width, height] = tex_util.getPackedMatrixTextureShapeWidthHeight(\n      texShape[0], texShape[1]);\n
program = new EncodeMatrixPackedProgram(\n      shapeAs3D, [height, width], isByteArray);\n      } else {\n
program =\n      new EncodeMatrixProgram(shapeAs3D, [height, width], isByteArray);\n      }\n\n      const
tempDenseInputHandle = this.makeTensorInfo([height, width], dtype);\n      if (isByteArray) {\n
this.texData.get(tempDenseInputHandle.dataId).usage =\n      TextureUsage.PIXELS;\n      } else {\n
this.texData.get(tempDenseInputHandle.dataId).usage =\n      TextureUsage.UPLOAD;\n      }\n\n      this.gpgpu.uploadDenseMatrixToTexture(\n
this.getTexture(tempDenseInputHandle.dataId), width, height,\n
values as TypedArray);\n\n      // We want the output to remain packed regardless of the value of\n      //
WEBGL_PACK.\n      const preventEagerUnpacking = true;\n      const encodedOutputTarget =
this.runWebGLProgram(\n      program, [tempDenseInputHandle], dtype, null, preventEagerUnpacking);\n\n      //
Have the original texture assume the identity of the encoded output.\n      const outputTexData =
this.texData.get(encodedOutputTarget.dataId);\n      texData.texture = outputTexData.texture;\n      texData.texShape
= outputTexData.texShape;\n      texData.isPacked = outputTexData.isPacked;\n      texData.usage =
outputTexData.usage;\n\n      this.disposeIntermediateTensorInfo(tempDenseInputHandle);\n
this.texData.delete(encodedOutputTarget.dataId);\n\n      // Once uploaded, don't store the values on cpu.\n
texData.values = null;\n      if (shouldTimeProgram) {\n      this.uploadWaitMs += util.now() - start;\n      }\n      }
else {\n      const newTexture = this.acquireTexture(texShape, usage, dtype, isPacked);\n      texData.texture =
newTexture;\n      }\n      }\n\n      private convertAndCacheOnCPU(dataId: DataId, float32Values?: Float32Array):\n
TypedArray {\n      const texData = this.texData.get(dataId);\n      const {dtype} = texData;\n\n      this.releaseGPUData(dataId);\n\n      if (float32Values != null) {\n      texData.values =
float32ToTypedArray(float32Values, dtype as 'float32');\n      }\n      return texData.values as TypedArray;\n      }\n\n      private acquireTexture(\n      texShape: [number, number], texType: TextureUsage, dtype: DataType,\n      isPacked:
boolean): WebGLTexture {\n      this.numBytesInGPU += this.computeBytes(texShape, dtype);\n      if
(!this.warnedAboutMemory &&\n      this.numBytesInGPU > this.numMBBeforeWarning * 1024 * 1024) {\n
const mb = (this.numBytesInGPU / 1024 / 1024).toFixed(2);\n      this.warnedAboutMemory = true;\n
console.warn(\n      `High memory usage in GPU: ${mb} MB, ` +\n      `most likely due to a memory leak`);\n
}\n      return this.textureManager.acquireTexture(texShape, texType, isPacked);\n      }\n\n      private
computeBytes(shape: [number, number], dtype: DataType) {\n      return shape[0] * shape[1] *
util.bytesPerElement(dtype);\n      }\n      }\n\n      function float32ToTypedArray<D extends NumericDataType>(\n      a:
Float32Array, dtype: D): tf.DataTypeMap[D] {\n      if (dtype === 'float32' || dtype === 'complex64') {\n      return a as
tf.DataTypeMap[D];\n      } else if (dtype === 'int32' || dtype === 'bool') {\n      const result = (dtype === 'int32') ? new
Int32Array(a.length) :\n      new Uint8Array(a.length);\n      for (let i = 0; i < result.length; ++i)
{\n      result[i] = Math.round(a[i]);\n      }\n      return result as tf.DataTypeMap[D];\n      } else {\n      throw new
Error(`Unknown dtype ${dtype}`);\n      }\n      }\n      }\n\n      /**\n      * @license\n      * Copyright 2019 Google LLC. All Rights
Reserved.\n      * Licensed under the Apache License, Version 2.0 (the "License");\n      * you may not use this file

```

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {env} from '@tensorflow/tfjs-core';\nimport * as gpgpu_util from './gpgpu_util';\nimport * as webgl_util from './webgl_util';\nexport {MathBackendWebGL, WebGLMemoryInfo, WebGLTimingInfo} from './backend_webgl';\nexport {setWebGLContext} from './canvas_util';\nexport {GPGPUContext} from './gpgpu_context';\nexport {GPGPUProgram} from './gpgpu_math';\n// WebGL specific utils.\nexport {gpgpu_util, webgl_util};\n\n/**\n * Enforce use of half precision textures if available on the platform.\n *\n * @doc {heading: 'Environment', namespace: 'webgl'}\n *\nexport function forceHalfFloat(): void {\n  env().set('WEBGL_FORCE_F16_TEXTURES', true);\n}\n\n",/**\n * @license\n * Copyright 2017 Google LLC.  
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\nexport const CHECK_NAN_SNIPPET = `n if (isnan(a)) return a;\n if (isnan(b)) return b;\n`;\nexport const SQUARED_DIFFERENCE = `return (a - b) * (a - b);`\nexport class BinaryOpProgram implements GPGPUProgram {\n  variableNames = ['A', 'B'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(op: string, aShape: number[], bShape: number[]) {\n    this.outputShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n    this.userCode = `n float binaryOperation(float a, float b) {\n  ${op}\n }\n\n void main() {\n  float a = getAAtOutCoords();\n  float b = getBAtOutCoords();\n  setOutput(binaryOperation(a, b));\n }\n`;\n}\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\nexport const CHECK_NAN_SNIPPET = `n result.r = isNaN.r > 0. ? NAN : result.r;\n result.g = isNaN.g > 0. ? NAN : result.g;\n result.b = isNaN.b > 0. ? NAN : result.b;\n result.a = isNaN.a > 0. ? NAN : result.a;\n`;\nexport const ELU_DER = `n vec4 bGTEZero = vec4(greaterThanEqual(b, vec4(0.)));\n return (bGTEZero * a) + ((vec4(1.0) - bGTEZero) * (a * (b + vec4(1.0))));\n`;\nexport const NOT_EQUAL = `n return vec4(notEqual(a, b));\n`;\nexport class BinaryOpPackedProgram implements GPGPUProgram {\n  variableNames = ['A', 'B'];\n  outputShape: number[];\n  userCode: string;\n  supportsBroadcasting = true;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(\n    op: string, aShape: number[], bShape: number[],\n    checkOutOfBounds = false) {\n    this.outputShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n    const rank = this.outputShape.length;\n    let checkOutOfBoundsString = `;\n    if (checkOutOfBounds) {\n      if (rank === 0 ||\n        util.sizeFromShape(this.outputShape) === 1) {\n        checkOutOfBoundsString = `n result.y = 0.;\n`;\n      }\n    }\n  }\n}
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result.z = 0.;\n      result.w = 0.;\n      `;\n    } else {\n      const dtype = getCoordsDataType(rank);\n      checkOutOfBoundsString = `\n      ${dtype} coords = getOutputCoords();\n      `;\n      if (rank === 1) {\n      checkOutOfBoundsString += `\n      result.y = (coords + 1) >= ${this.outputShape[0]} ? 0. : result.y;\n      result.z = 0.;\n      result.w = 0.;\n      `;\n    } else {\n      const channels = getChannels('coords', rank);\n      checkOutOfBoundsString += `\n      bool nextRowOutOfBounds =\n      (${channels[rank - 2]} + 1) >=\n      ${this.outputShape[rank - 2]};\n      bool nextColOutOfBounds =\n      (${channels[rank - 1]} + 1) >=\n      ${this.outputShape[rank - 1]};\n      result.y = nextColOutOfBounds ? 0. : result.y;\n      result.z =\n      nextRowOutOfBounds ? 0. : result.z;\n      result.w = nextColOutOfBounds || nextRowOutOfBounds ? 0. :\n      result.w;\n      `;\n    }\n  }\n}\n\nthis.userCode = `\n  vec4 binaryOperation(vec4 a, vec4 b) {\n  ${op}\n  }\n\n  void main() {\n    vec4 a = getAAtOutCoords();\n    vec4 b = getBAtOutCoords();\n    vec4 result = binaryOperation(a, b);\n    ${checkOutOfBoundsString}\n    setOutput(result);\n  }\n  `;\n}\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n * License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required\n * by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n * License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {env, KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{BinaryOpProgram} from './binaryop_gpu';\nimport {BinaryOpPackedProgram} from
'./binaryop_packed_gpu';\n\nexport const LEAKYRELU = `return (a < 0.) ? b * a : a;`;\nexport const
LEAKYRELU_PACKED = `\n  vec4 aLessThanZero = vec4(lessThan(a, vec4(0.)));\n  return (aLessThanZero * (b
* a)) + ((vec4(1.0) - aLessThanZero) * a);`\n\n\nexport function leakyRelu(args: {\n  inputs: LeakyReluInputs,\n  backend: MathBackendWebGL,\n  attrs: LeakyReluAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {x} = inputs;\n  const {alpha} = attrs;\n\n  const $alpha = backend.makeTensorInfo(\n    [],
'float32',\n    util.createScalarValue(alpha as {} as 'float32', 'float32'));\n\n  const program =
env().getBool('WEBGL_PACK_BINARY_OPERATIONS') ?\n    new
BinaryOpPackedProgram(LEAKYRELU_PACKED, x.shape, $alpha.shape) :\n    new
BinaryOpProgram(LEAKYRELU, x.shape, $alpha.shape);\n  const result = backend.runWebGLProgram(program,
[x, $alpha], x.dtype);\n  backend.disposeIntermediateTensorInfo($alpha);\n  return result;\n}\n\n\nexport const
leakyReluConfig: KernelConfig = {\n  kernelName: LeakyRelu,\n  backendName: 'webgl',\n  kernelFunc: leakyRelu
as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {env, KernelConfig, KernelFunc, Prelu, PreluInputs, TensorInfo} from '@tensorflow/tfjs-
core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {BinaryOpProgram} from
'./binaryop_gpu';\nimport {BinaryOpPackedProgram} from './binaryop_packed_gpu';\n\nexport const PRELU =
`return (a < 0.) ? b * a : a;`;\nexport const PRELU_PACKED = `\n  vec4 aLessThanZero = vec4(lessThan(a,
vec4(0.)));\n  return (aLessThanZero * (b * a)) + ((vec4(1.0) - aLessThanZero) * a);`\n\n\nexport function
prelu(args: {inputs: PreluInputs, backend: MathBackendWebGL}):\n  TensorInfo {\n  const {inputs, backend} =
args;\n  const {x, alpha} = inputs;\n\n  const program = env().getBool('WEBGL_PACK_BINARY_OPERATIONS')
?\n    new BinaryOpPackedProgram(PRELU_PACKED, x.shape, alpha.shape) :\n    new

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BinaryOpProgram(PRELU, x.shape, alpha.shape);\n return backend.runWebGLProgram(program, [x, alpha],
x.dtype);\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'webgl',\n kernelFunc: prelu as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {backend_util, BinaryInputs, DataType, env, KernelFunc, TypedArray, UnaryInputs, upcastType}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport
{BinaryOpProgram} from './binaryop_gpu';\nimport {BinaryOpPackedProgram} from
'./binaryop_packed_gpu';\nimport {complex} from './kernels/Complex';\nimport {LEAKYRELU,
LEAKYRELU_PACKED} from './kernels/LeakyRelu';\nimport {PRELU, PRELU_PACKED} from
'./kernels/Prelu';\nimport * as unary_op from './unaryop_gpu';\nimport {UnaryOpProgram} from
'./unaryop_gpu';\nimport * as unary_packed_op from './unaryop_packed_gpu';\nimport {UnaryOpPackedProgram}
from './unaryop_packed_gpu';\n\nimport {SimpleBinaryKernelImplCPU, SimpleUnaryKernelImplCPU} from
'./shared';\n\nexport const CHECK_NAN_SNIPPET_UNARY = `if (isnan(x)) return x;`;\n\nexport const
CHECK_NAN_SNIPPET_BINARY = `\n if (isnan(a)) return a;\n if (isnan(b)) return b;\n`;\n\nexport const
CHECK_NAN_SNIPPET_BINARY_PACKED = `\n result.r = isNaN.r > 0. ? NAN : result.r;\n result.g = isNaN.g
> 0. ? NAN : result.g;\n result.b = isNaN.b > 0. ? NAN : result.b;\n result.a = isNaN.a > 0. ? NAN :
result.a;\n`;\n\ntype UnaryKernelFuncConfig = {\n opSnippet: string,\n packedOpSnippet?: string,\n
cpuKernelImpl?: SimpleUnaryKernelImplCPU,\n dtype?: DataType\n};\n\n/**\n * Template that creates a
`KernelFunc` for unary ops.\n * @param opSnippet Op snippet to create `UnaryOpProgram`.\n * @param
packedOpSnippet Op snippet to create `UnaryOpPackedProgram`.\n * @param dtype Optional. If set, the result has
this dtype. Otherwise, the\n * result has the same dtype as the first input. This is mainly used in\n *
comparison kernels, such as Equal, Less, Greater, etc.\n */\nexport function unaryKernelFunc(\n {opSnippet,
packedOpSnippet, cpuKernelImpl, dtype}: UnaryKernelFuncConfig):\n KernelFunc {\n return ({inputs,
backend}) => {\n const {x} = inputs as UnaryInputs;\n const webglBackend = backend as
MathBackendWebGL;\n\n const $dtype = dtype || x.dtype;\n if (webglBackend.shouldExecuteOnCPU([x]) &&
cpuKernelImpl != null) {\n const xData = webglBackend.texData.get(x.dataId);\n const outValues =
cpuKernelImpl(xData.values as TypedArray, $dtype);\n return webglBackend.makeTensorInfo(x.shape, $dtype,
outValues);\n }\n\n const shouldUsePackedProgram =\n env().getBool('WEBGL_PACK_UNARY_OPERATIONS') && packedOpSnippet != null;\n let program:
UnaryOpProgram|UnaryOpPackedProgram;\n if (shouldUsePackedProgram) {\n program = new
UnaryOpPackedProgram(x.shape, packedOpSnippet);\n } else {\n program = new UnaryOpProgram(x.shape,
opSnippet);\n }\n\n return webglBackend.runWebGLProgram(program, [x], $dtype);\n };}\n\ntype
BinaryKernelFuncConfig = {\n opSnippet: string,\n packedOpSnippet?: string,\n checkOutOfBounds?: boolean,\n
supportsComplex?: boolean,\n cpuKernelImpl?: SimpleBinaryKernelImplCPU,\n dtype?: DataType\n};\n\n/**\n *
Template that creates a `KernelFunc` for binary ops.\n * @param opSnippet Op snippet to create
`BinaryOpProgram`.\n * @param packedOpSnippet Op snippet to create `BinaryOpPackedProgram`.\n * @param
checkOutOfBoundsForPackedProgram Whether to set checkOutOfBounds=true\n * when creating
BinaryOpPackedProgram.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n *
result has the same dtype as the first input. This is mainly used in\n * comparison kernels, such as Equal, Less, Greater,
etc.\n */\nexport function binaryKernelFunc({\n opSnippet,\n packedOpSnippet,\n checkOutOfBounds = false,\n
supportsComplex = false,\n cpuKernelImpl,\n dtype\n}: BinaryKernelFuncConfig): KernelFunc {\n return
({inputs, backend}) => {\n const {a, b} = inputs as BinaryInputs;\n const webglBackend = backend as

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activationSnippet = `vec4 activation(vec4 a) {\n      vec4 b = getPreluActivationWeightsAtOutCoords();\n
${activation}\n    };\n  } else if (hasLeakyreluActivation) {\n    activationSnippet = `vec4 activation(vec4 a)
{\n      vec4 b = getLeakyreluAlphaAtOutCoords();\n      ${activation}\n    };\n  } else {\n
activationSnippet = `vec4 activation(vec4 x) {\n      ${activation}\n    };\n  }\n\n  applyActivationSnippet
= `result = activation(result);;\n  }\n\n  const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : '';\n
if (addBias) {\n    this.variableNames.push('bias');\n  }\n\n  if (hasPreluActivation) {\n
this.variableNames.push('preluActivationWeights');\n  }\n\n  if (hasLeakyreluActivation) {\n
this.variableNames.push('leakyreluAlpha');\n  }\n\n  let batchASnippet = 'rc.x';\n  let batchBSnippet = 'rc.x';\n
if (aShape[0] < bShape[0]) {\n    batchASnippet = `int(min(float(rc.x), ${aShape[0] - 1}));\n  } else if
(bShape[0] < aShape[0]) {\n    batchBSnippet = `int(min(float(rc.x), ${bShape[0] - 1}));\n  }\n\n  this.userCode
= `\n    ${activationSnippet}\n\n    const float sharedDimension = ${sharedDimensionPacked}.0;\n\n    vec4
dot2x2ARowBCol(ivec3 rc) {\n      vec4 result = vec4(0);\n      for (int i = 0; i < ${sharedDimensionPacked}; i++)
{\n        int batchA = ${batchASnippet};\n        int batchB = ${batchBSnippet};\n        vec4 a =
getMatrixA(batchA, ${aSample});\n        vec4 b = getMatrixB(batchB, ${bSample});\n        // These swizzled
products need to be separately added.\n        // See: https://github.com/tensorflow/tfjs/issues/1735\n        result +=
(${aSwizzle[0]} * ${bSwizzle[0]});\n        result += (${aSwizzle[1]} * ${bSwizzle[1]});\n      }\n      return
result;\n    }\n\n    void main() {\n      ivec3 rc = getOutputCoords();\n      vec4 result =
dot2x2ARowBCol(rc);\n\n      ${addBiasSnippet}\n\n      ${applyActivationSnippet}\n\n      setOutput(result);\n
    }\n  `;\n  }\n}\n\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
\n\n
=====
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\n//
(Ar + Ai)(Br + Bi) =\n// ArBr + ArBi + AiBr + AiBi = ArBr - AB + ArBi + AiBr\n// Yr = ArBr - AB\n// Yi = ArBi
+ AiBr\n\nexport const COMPLEX_MULTIPLY = {\n  REAL: 'return areal * breal - aimag * bimag;',\n  IMAG:
'return areal * bimag + aimag * breal;'\n};\n\nexport class BinaryOpComplexProgram implements GPGPUProgram
{\n  variableNames = ['AReal', 'AImag', 'BReal', 'BImag'];\n  userCode: string;\n  outputShape: number[];\n\n  constructor(op: string, aShape: number[], bShape: number[]) {\n    this.outputShape =
backend_util.assertAndGetBroadcastShape(aShape, bShape);\n\n    this.userCode = `\n    float
binaryOpComplex(\n      float areal, float aimag, float breal, float bimag) {\n      ${op}\n    }\n\n    void main()
{\n      float areal = getARealAtOutCoords();\n      float aimag = getAImagAtOutCoords();\n      float breal =
getBRealAtOutCoords();\n      float bimag = getBImagAtOutCoords();\n      setOutput(binaryOpComplex(areal,
aimag, breal, bimag));\n    }\n  `;\n  }\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
\n\n
=====
*\n\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from
'./backend_webgl';\nimport {ReshapePackedProgram} from './reshape_packed_gpu';\nimport {getBatchDim,
getRowsCols} from './webgl_util';\n\nexport function packedReshape(\n  input: TensorInfo, afterShape:
number[],\n  backend: MathBackendWebGL): TensorInfo {\n  const input3DShape =\n

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[getBatchDim(input.shape),\n    ...getRowsCols(input.shape)] as [number, number, number];\n const input3D:\n TensorInfo = {\n  dtype: input.dtype,\n  shape: input3DShape,\n  dataId: input.dataId\n };\n const\n afterShapeAs3D =\n [getBatchDim(afterShape),\n  ...getRowsCols(afterShape)] as [number, number,\n  number];\n const program = new ReshapePackedProgram(afterShapeAs3D, input3DShape);\n const\n preventEagerUnpackingOfOutput = true;\n const output = backend.runWebGLProgram(\n  program, [input3D],\n  input.dtype, null /* customSetup */,\n  preventEagerUnpackingOfOutput);\n return {dataId: output.dataId, shape:\n  afterShape, dtype: output.dtype};\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n  compliance with the License.\n * You may obtain a copy of the License at\n  http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n  WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n  limitations under the License.\n *
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```
=====\n*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {packedReshape}\n from './kernel_utils/reshape';\nimport {isReshapeFree} from './webgl_util';\n\nexport function reshape(args: {\n  inputs: ReshapeInputs,\n  backend: MathBackendWebGL,\n  attrs: ReshapeAttrs\n}): TensorInfo {\n  const {inputs,\n  backend, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n  const webglBackend = backend;\n\n  const\n xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n  const $xSize\n = util.sizeFromShape($shape);\n  util.assert(\n    xSize === $xSize,\n    () => `The new shape (${ $shape }) has\n    ${ $xSize } elements and the old ` +\n    `shape (${ x.shape }) has ${ xSize } elements. The new shape and old ` +\n    `shape must have the same number of elements.`);\n  const xTexData =\n  webglBackend.texData.get(x.dataId);\n  if (xTexData.isPacked && !isReshapeFree(x.shape, $shape) &&\n  !(xTexData.texture !== null && isReshapeFree(xTexData.shape, $shape))) {\n    return packedReshape(x, $shape,\n  webglBackend);\n  }\n  webglBackend.incRef(x.dataId);\n  return {dataId: x.dataId, shape: $shape, dtype:\n  x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName:\n  'webgl',\n  kernelFunc: reshape as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n  Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n  http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n  WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n  limitations under the License.\n *
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```
=====\n*\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from\n './gpgpu_math';\n\nexport class MeanProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(reduceInfo: backend_util.ReduceInfo, divisor?:\n  number) {\n    const {windowSize, batchSize, inSize, outSize} = reduceInfo;\n    this.outputShape = [batchSize,\n  outSize];\n    const\n  windowSizeNearestVec4 = Math.floor(windowSize / 4) * 4;\n    const\n  windowSizeVec4Remainder = windowSize % 4;\n    let\n  updateSnippet = `sumValue += dot(values, ones);`\n    if (divisor !== null) {\n      const\n  denominator = 1 / divisor;\n      updateSnippet = `sumValue += dot(values * ${\n  util.isInt(denominator) ? denominator.toPrecision(2) :\n  denominator}, ones);`\n    }\n    let\n  checkOutOfBounds = `;\n    if (inSize % windowSize > 0) {\n      checkOutOfBounds = `\n    if (inIdx < 0 || inIdx\n  >= ${inSize}) {\n      return 0.0;\n    }`\n    }\n    this.userCode = `\n    const\n  vec4 ones = vec4(1.0,\n  1.0, 1.0, 1.0);\n    float\n  getValue(int batch, int inIdx) {\n      ${checkOutOfBounds}\n      return\n  getX(batch,\n  inIdx);\n    }\n    void\n  main() {\n      ivec2\n  coords = getOutputCoords();\n      int\n  batch = coords[0];\n      int\n  outIdx = coords[1];\n      int\n  inOffset = outIdx * ${windowSize};\n      float\n  sumValue = 0.0;\n      for (int i =`
```

```

0; i < ${windowSizeNearestVec4}; i += 4) {\n      int inIdx = inOffset + i;\n      vec4 values = vec4(\n
getValue(batch, inIdx),\n      getValue(batch, inIdx + 1),\n      getValue(batch, inIdx + 2),\n
getValue(batch, inIdx + 3)\n      );\n\n      ${updateSnippet}\n      }\n\n      int inIdx = inOffset +
${windowSizeNearestVec4};\n      if (${windowSizeVec4Remainder} === 1) {\n      vec4 values =
vec4(getValue(batch, inIdx), 0.0, 0.0, 0.0);\n\n      ${updateSnippet}\n      } else if
(${windowSizeVec4Remainder} === 2) {\n      vec4 values = vec4(\n      getValue(batch, inIdx),\n
getValue(batch, inIdx + 1), 0.0, 0.0);\n\n      ${updateSnippet}\n      } else if (${windowSizeVec4Remainder}
=== 3) {\n      vec4 values = vec4(\n      getValue(batch, inIdx),\n      getValue(batch, inIdx + 1),\n
getValue(batch, inIdx + 2), 0.0);\n\n      ${updateSnippet}\n      }\n      setOutput(sumValue);\n      }\n `;\n
}\n}\n", "/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
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=====
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class ReduceProgram implements GPGPUProgram {\n  variableNames = ['x'];\n
outputShape: number[];\n  userCode: string;\n\n  constructor(\n    reduceInfo: backend_util.ReduceInfo,\n
reduceType: 'all'|'any'|'max'|'min'|'sum'|'prod') {\n    const {windowSize, batchSize, inSize, outSize} = reduceInfo;\n
this.outputShape = [batchSize, outSize];\n\n    let initializationValue = '0.0';\n    let compareOp = ` `;\n\n    if
(reduceType === 'prod') {\n      initializationValue = '1.0';\n    } else if (reduceType === 'min') {\n      // WebGL on
Firefox Linux can't compile 1/0 so we do 1/eps.\n      initializationValue = '1.0 / 1e-20';\n      compareOp = `min`;\n
    } else if (reduceType === 'max') {\n      // WebGL on Firefox Linux can't compile 1/0 so we do 1/eps.\n
initializationValue = '-1.0 / 1e-20';\n      compareOp = `max`;\n    }\n\n    let returnValue =
`${reduceType}(${reduceType}(${reduceType}(` +\n      'minMaxValue[0], minMaxValue[1], minMaxValue[2]),\n
minMaxValue[3]');\n\n    if (reduceType === 'sum') {\n      returnValue = `sumValue`;\n    } else if (reduceType ===
'prod') {\n      returnValue = `prodValue`;\n    } else if (reduceType === 'all') {\n      returnValue = `allValue`;\n
    } else if (reduceType === 'any') {\n      returnValue = `anyValue`;\n    }\n\n    const windowSizeNearestVec4 =
Math.floor(windowSize / 4) * 4;\n    const windowSizeVec4Remainder = windowSize % 4;\n\n    let updateSnippet
= `\n    if (${reduceType} === 'sum') {\n      sumValue += dot(values, ones);\n    } else if (${reduceType} ===
'prod') {\n      vec2 tmp = vec2(values[0], values[1]) * vec2(values[2], values[3]);\n      prodValue *= tmp[0] *
tmp[1];\n    } else {\n      minMaxValue = ${compareOp}(values, minMaxValue);\n    }\n `;\n\n    let vecType
= `vec4`;\n    if (reduceType === 'all') {\n      initializationValue = '1.0';\n      updateSnippet = `\n      bool
reducedAllValue = all(values);\n      float floatedReducedAllValue = float(reducedAllValue);\n      allValue =
float(allValue >= 1.0 && floatedReducedAllValue >= 1.0);\n `;\n      vecType = `bvec4`;\n    } else if
(reduceType === 'any') {\n      initializationValue = '0.0';\n      updateSnippet = `\n      bool reducedAnyValue =
any(values);\n      float floatedReducedAnyValue = float(reducedAnyValue);\n      anyValue = float(anyValue >=
1.0 || floatedReducedAnyValue >= 1.0);\n `;\n      vecType = `bvec4`;\n    }\n\n    let checkOutOfBounds = ` `;\n
if (inSize % windowSize > 0) {\n      checkOutOfBounds = `\n      if (inIdx < 0 || inIdx >= ${inSize}) {\n
return initializationValue;\n      }\n `;\n    }\n\n    this.userCode = `\n    const float initializationValue =
${initializationValue};\n    const vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n\n    float getValue(int batch, int inIdx) {\n
      ${checkOutOfBounds}\n      return getX(batch, inIdx);\n    }\n\n    void main() {\n      ivec2 coords =
getOutputCoords();\n      int batch = coords[0];\n      int outIdx = coords[1];\n      int inOffset = outIdx *
${windowSize};\n\n      vec4 minMaxValue = vec4(${initializationValue});\n      float prodValue = 1.0;\n
float sumValue = 0.0;\n      float allValue = 1.0;\n      float anyValue = 0.0;\n\n      for (int i = 0; i <
${windowSizeNearestVec4}; i += 4) {\n      int inIdx = inOffset + i;\n      ${vecType} values = ${vecType}(\n
      getValue(batch, inIdx),\n      getValue(batch, inIdx + 1),\n      getValue(batch, inIdx + 2),\n

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    getValue(batch, inIdx + 3)\n        );\n\n        ${updateSnippet}\n        }\n\n        int inIdx = inOffset +
    ${windowSizeNearestVec4};\n        if (${windowSizeVec4Remainder === 1}) {\n            ${vecType} values =
    ${vecType}(\n                getValue(batch, inIdx),\n                initializationValue,\n                initializationValue,\n                initializationValue\n            );\n\n            ${updateSnippet}\n        } else if (${windowSizeVec4Remainder === 2}) {\n
        ${vecType} values = ${vecType}(\n            getValue(batch, inIdx),\n            getValue(batch, inIdx + 1),\n            initializationValue,\n            initializationValue\n        );\n\n        ${updateSnippet}\n        } else if
    (${windowSizeVec4Remainder === 3}) {\n            ${vecType} values = ${vecType}(\n                getValue(batch,
    inIdx),\n                getValue(batch, inIdx + 1),\n                getValue(batch, inIdx + 2),\n                initializationValue\n
    );\n\n            ${updateSnippet}\n        }\n        setOutput(${returnValue});\n    }\n    `;\n    }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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=====
*\n\nimport {backend_util, DataType, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
    {MathBackendWebGL} from '../backend_webgl';\n\nimport {MeanProgram} from '../mean_gpu';\n\nimport
    {ReduceProgram} from '../reduce_gpu';\n\nntype ReduceTypes = 'all'|'any'|'max'|'min'|'sum'|'prod'|'mean';\n\n//
    Returns an array of configuration objects that describe each stage of the\n// reduction.\n\nfunction
    getReductionStages(inShape: number[]):\n    Array<{inSize: number, windowSize: number, outSize: number}> {\n
    const stages = [];\n\n    while (stages.length === 0 || stages[stages.length - 1].outSize !== 1) {\n        const outSize:
    number =\n            stages.length ? stages[stages.length - 1].outSize : inShape[1];\n        const windowSize =
    backend_util.computeOptimalWindowSize(outSize);\n        stages.push({\n            inSize: outSize,\n            windowSize,\n
    outSize: Math.ceil(outSize / windowSize)\n        });\n    }\n\n    return stages;\n}\n\nexport function reduce(\n    x:
    TensorInfo, dtype: DataType, reductionType: ReduceTypes,\n    backend: MathBackendWebGL): TensorInfo {\n
    const reductionStages = getReductionStages(x.shape);\n\n    let result = x;\n    for (let i = 0; i < reductionStages.length;
    i++) {\n        const {inSize, windowSize, outSize} = reductionStages[i];\n\n        let program:
    ReduceProgram|MeanProgram;\n        let previousResult: TensorInfo;\n        if (reductionType === 'mean') {\n
            program = i === 0 ?\n                new MeanProgram(\n                    {windowSize, inSize, batchSize: x.shape[0], outSize},
    inSize) : \n                new MeanProgram({windowSize, inSize, batchSize: x.shape[0], outSize});\n        } else {\n
            program = new ReduceProgram(\n                {windowSize, inSize, batchSize: x.shape[0], outSize}, reductionType);\n
        }\n\n        previousResult = result;\n        result = backend.runWebGLProgram(program, [result], dtype);\n\n        if
    (previousResult.dataId !== x.dataId) {\n            backend.disposeIntermediateTensorInfo(previousResult);\n        }\n    }\n\n
    return result;\n}\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
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=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nimport {getCoordsDataType} from
    './shader_compiler';\n\nexport class TransposeProgram implements GPGPUProgram {\n    variableNames = ['A'];\n
    outputShape: number[];\n    userCode: string;\n    rank: number;\n\n    constructor(aShape: number[], newDim:
    number[]) {\n        const outputShape: number[] = new Array(aShape.length);\n        for (let i = 0; i < outputShape.length;
    i++) {\n            outputShape[i] = aShape[newDim[i]];\n        }\n        this.outputShape = outputShape;\n        this.rank =
    outputShape.length;\n        const dtype = getCoordsDataType(this.rank);\n        const switched =

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getSwitchedCoords(newDim);\n\n this.userCode = `\n void main() {\n  ${dtype} resRC =
getOutputCoords();\n  setOutput(getA(${switched}));\n  }\n `;\n }\n}\n\nfunction
getSwitchedCoords(newDim: number[]): string {\n  const rank = newDim.length;\n  if (rank > 6) {\n    throw
Error(`Transpose for rank ${rank} is not yet supported`);\n  }\n  const originalOrder =\n    ['resRC.x', 'resRC.y',
'resRC.z', 'resRC.w', 'resRC.u', 'resRC.v'];\n  const switchedCoords = new Array(rank);\n  for (let i = 0; i <
newDim.length; i++) {\n    switchedCoords[newDim[i]] = originalOrder[i];\n  }\n  return
switchedCoords.join();\n}\n\n",/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getVecChannels} from './packing_util';\nimport
{getCoordsDataType} from './shader_compiler';\n\nexport class TransposePackedProgram implements
GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(aShape: number[], newDim: number[]) {\n    const
outputShape: number[] = new Array(aShape.length);\n    for (let i = 0; i < outputShape.length; i++) {\n
outputShape[i] = aShape[newDim[i]];\n    }\n    this.outputShape = outputShape;\n    this.rank =
outputShape.length;\n    if (this.rank > 6) {\n      throw Error(`Packed transpose for rank ${this.rank} is not
yet supported.`);\n    }\n    const dtype = getCoordsDataType(this.rank);\n    const outputOrder =
getVecChannels('rc', this.rank);\n    const switchedOrder = new Array(this.rank);\n    for (let i = 0; i <
newDim.length; i++) {\n      switchedOrder[newDim[i]] = outputOrder[i];\n    }\n    const innerDims =
`vec2(${switchedOrder.slice(-2).join()}`;\n    const nextColumn =\n      `++${outputOrder[this.rank - 1]} <
${outputShape[this.rank - 1]}`;\n    const getc = `getChannel(getA(${switchedOrder.join()}), ${innerDims})`;\n\n
this.userCode = `\n void main() {\n  ${dtype} rc = getOutputCoords();\n  vec4 result = vec4(0.);\n
result[0] = ${getc};\n  if (${nextColumn}) {\n    result[1] = ${getc};\n  }\n  --${outputOrder[this.rank -
1]};\n  if (++${outputOrder[this.rank - 2]} < ${outputShape[this.rank - 2]}) {\n    result[2] = ${getc};\n
if (${nextColumn}) {\n    result[3] = ${getc};\n  }\n  }\n  setOutput(result);\n  }\n `;\n }\n}\n\n",/*\n *
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*\n\nimport {backend_util, sumOutType, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from '../backend_webgl';\nimport {reduce} from './kernel_utils/reduce';\nimport {reshape}
from './Reshape';\n\nimport {transposeImpl} from './Transpose_impl';\n\nexport function sumImpl(\n  x:
TensorInfo, axis: number|number[], keepDims: boolean,\n  backend: MathBackendWebGL): TensorInfo {\n  const
reductionIndices = axis;\n  const xRank = x.shape.length;\n  const origAxes =
util.parseAxisParam(reductionIndices, x.shape);\n  let axes = origAxes;\n  const permutedAxes =
backend_util.getAxesPermutation(axes, xRank);\n  const sumInputIsTransposed = permutedAxes != null;\n  let
sumInput = x;\n  if (sumInputIsTransposed) {\n    sumInput = transposeImpl(x, permutedAxes, backend);\n  }\n  axes
= backend_util.getInnerMostAxes(axes.length, xRank);\n  }\n\n  backend_util.assertAxesAreInnerMostDims('sum',
axes, xRank);\n  const [sumOutShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(sumInput.shape, axes);\n  let outShape = sumOutShape;\n  if

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(keepDims) {\n // rather than reshape at the end, set the target shape here.\n  outShape =
backend_util.expandShapeToKeepDim(sumOutShape, origAxes);\n }\n\n const inSize =
util.sizeFromShape(reduceShape);\n const xSize = util.sizeFromShape(x.shape);\n const batchSize = xSize /
inSize;\n const reshapedInput = reshape(\n  {inputs: {x: sumInput}, attrs: {shape: [batchSize, inSize]},
backend});\n\n const outType = sumOutType(x.dtype);\n\n const reduced = reduce(reshapedInput, outType, 'sum',
backend);\n const out =\n  reshape({inputs: {x: reduced}, attrs: {shape: outShape}, backend});\n\n
backend.disposeIntermediateTensorInfo(reshapedInput);\n backend.disposeIntermediateTensorInfo(reduced);\n if
(sumInputsTransposed) {\n  backend.disposeIntermediateTensorInfo(sumInput);\n }\n\n return out;\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
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the specific language governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {sumImpl} from './Sum_impl';\n\nexport function
sum(\n  args: {inputs: SumInputs, attrs: SumAttrs, backend: MathBackendWebGL}) {\n  const {inputs, backend,
attrs} = args;\n\n  const {x} = inputs;\n  const {axis, keepDims} = attrs;\n\n  return sumImpl(x, axis, keepDims,
backend);\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'webgl',\n
kernelFunc: sum as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\n\nimport {backend_util, TensorInfo, upcastType, util} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {mapActivationToShaderProgram} from
'./kernel_utils/kernel_funcs_utils';\n\nimport {MatMulPackedProgram} from './mulmat_packed_gpu';\n\nimport
{multiply} from './Multiply';\n\nimport {reshape} from './Reshape';\n\nimport {sum} from './Sum';\n\nimport {transpose}
from './Transpose';\n\n// Empirically determined minimal shared dimension in matmul before we forward\n// to
a.mul(b).sum() in order to take advantage of GPU parallelism. See\n// https://github.com/tensorflow/tfjs-
core/pull/1379 for benchmarks.\n\nexport const MATMUL_SHARED_DIM_THRESHOLD = 1000;\n\nntype
BatchMatMulConfig = {\n  a: TensorInfo,\n  b: TensorInfo,\n  transposeA: boolean,\n  transposeB: boolean,\n
backend: MathBackendWebGL,\n  bias?: TensorInfo,\n  preluActivationWeights?: TensorInfo,\n  leakyreluAlpha?:
number,\n  activation?: backend_util.Activation\n};\n\nexport function batchMatMulImpl({\n  a,\n  b,\n
transposeA,\n  transposeB,\n  backend,\n  bias = null,\n  preluActivationWeights = null,\n  leakyreluAlpha = 0,\n
activation = null\n}: BatchMatMulConfig): TensorInfo {\n  const aRank = a.shape.length;\n  const bRank =
b.shape.length;\n\n  const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n  const
innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n  const outerShapeA = transposeA ?
a.shape[aRank - 1] : a.shape[aRank - 2];\n  const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -
1];\n\n  const outerDimsA = a.shape.slice(0, -2);\n  const outerDimsB = b.shape.slice(0, -2);\n\n  const batchDimA =
util.sizeFromShape(outerDimsA);\n  const batchDimB = util.sizeFromShape(outerDimsB);\n\n  const
batchDimsCompatible =\n    batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n  util.assert(\n    aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n    () => `Error in matMul: the input
batch dimensions must either be the ` +\n    `same or at least one input batch dimension must be 1. Got input `
```

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+\n    `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\nbatchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape =\noutShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n  innerShapeA === innerShapeB,\n  () => `Error in matMul: inner shapes (${innerShapeA}) and ` +\n    `${innerShapeB}` of Tensors with shapes\n  ${a.shape} and ` +\n    `${b.shape} and transposeA=${transposeA}` +\n    ` and transposeB=${transposeB}\n  must match.`);\n\n const a3dShape: [number, number, number] = transposeA ?\n  [batchDimA, innerShapeA,\n  outerShapeA] :\n  [batchDimA, outerShapeA, innerShapeA];\n const b3dShape: [number, number, number] =\n  transposeB ?\n  [batchDimB, outerShapeB, innerShapeB] :\n  [batchDimB, innerShapeB, outerShapeB];\n\n //\n  The rest of the implementation is designed to operate on rank-3 tensors\n  const a3d = reshape({inputs: {x: a},\n  backend, attrs: {shape: a3dShape}});\n  const b3d = reshape({inputs: {x: b}, backend, attrs: {shape:\n  b3dShape}});\n\n  const intermediates: TensorInfo[] = [a3d, b3d];\n  const batchDim = Math.max(batchDimA,\n  batchDimB);\n  const sharedDim = transposeA ? a3d.shape[1] : a3d.shape[2];\n  const hasBias = bias != null;\n  const hasPreluActivationWeights = preluActivationWeights != null;\n  const hasLeakyreluAlpha = activation ===\n  'leakyrelu';\n  const fusedActivation = activation != null ?\n  mapActivationToShaderProgram(activation, true) :\n  null;\n  const containsFusedOps = hasBias || hasPreluActivationWeights ||\n  hasLeakyreluAlpha ||\n  fusedActivation != null;\n  let out: TensorInfo;\n\n  // Since the matrices are vectors, it is faster to call mul().sum()\n  // because sum() is O(sqrt(N)) due to divide-and-conquer.\n  if ((outerShapeA === 1 || outerShapeB === 1) &&\n  sharedDim > MATMUL_SHARED_DIM_THRESHOLD && containsFusedOps === false) {\n  let aVec = a3d;\n  let bVec = b3d;\n  if (transposeA) {\n  aVec = transpose({inputs: {x: a3d}, backend, attrs: {perm: [0, 2, 1]}});\n  intermediates.push(aVec);\n  }\n  if (transposeB) {\n  bVec = transpose({inputs: {x: b3d}, backend, attrs:\n  {perm: [0, 2, 1]}});\n  intermediates.push(bVec);\n  }\n\n  const shouldReshapeA = outerShapeB !== 1;\n  const shouldReshapeB = outerShapeB === 1;\n\n  let aVec3d = aVec;\n  if (shouldReshapeA) {\n  aVec3d =\n  reshape({\n  inputs: {x: aVec},\n  backend,\n  attrs: {shape: [batchDim, sharedDim, 1]}\n  });\n  intermediates.push(aVec3d);\n  }\n\n  const axis = outerShapeB === 1 ? 2 : 1;\n  let bVec3d = bVec;\n  if\n  (shouldReshapeB) {\n  bVec3d = reshape({\n  inputs: {x: bVec},\n  backend,\n  attrs: {shape:\n  [batchDim, 1, sharedDim]}\n  });\n  intermediates.push(bVec3d);\n  }\n\n  const product =\n  multiply({inputs: {a: aVec3d, b: bVec3d}, backend});\n  out = sum({inputs: {x: product}, backend, attrs: {axis,\n  keepDims: true}});\n  intermediates.push(product);\n  } else {\n  const dtype = upcastType(a.dtype, b.dtype);\n  const program = new MatMulPackedProgram(\n  a3dShape, b3dShape, [batchDim, outerShapeA, outerShapeB],\n  transposeA,\n  transposeB, hasBias, fusedActivation, hasPreluActivationWeights,\n  hasLeakyreluAlpha);\n\n  const inputs: TensorInfo[] = [a3d, b3d];\n  if (bias != null) {\n  inputs.push(bias);\n  }\n  if (hasPreluActivationWeights) {\n  inputs.push(preluActivationWeights);\n  }\n  if (hasLeakyreluAlpha)\n  {\n  const $leakyreluAlpha = backend.makeTensorInfo(\n  [], 'float32',\n  util.createScalarValue(leakyreluAlpha as {} as 'float32', 'float32'));\n  inputs.push($leakyreluAlpha);\n  intermediates.push($leakyreluAlpha);\n  }\n\n  out = backend.runWebGLProgram(program, inputs, dtype);\n  }\n\n  const outReshaped =\n  reshape({inputs: {x: out}, backend, attrs: {shape: outShape}});\n  intermediates.push(out);\n  for (const i of intermediates) {\n  backend.disposeIntermediateTensorInfo(i);\n  }\n  return outReshaped;\n  }\n  }", "/*\n  * @license\n  * Copyright 2020 Google LLC. All Rights Reserved.\n  * Licensed\n  * under the Apache License, Version 2.0 (the License);\n  * you may not use this file except in compliance with the\n  * License.\n  * You may obtain a copy of the License at\n  * http://www.apache.org/licenses/LICENSE-2.0\n  * Unless required by applicable law or agreed to in writing, software\n  * distributed under the License is distributed\n  * on an AS IS BASIS,\n  * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  * implied.\n  * See the License for the specific language governing permissions and\n  * limitations under the\n  * License.\n  */\n  =====\n  *\n  import { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from\n  '@tensorflow/tfjs-core';\n  import { MathBackendWebGL } from './backend_webgl';\n  import { batchMatMulImpl }\n  from './BatchMatMul_impl';\n  export function _fusedMatMul(args: {\n  inputs: _FusedMatMulInputs,\n  attrs:

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_FusedMatMulAttrs,\n backend: MathBackendWebGL\n)) {\n const {inputs, backend, attrs} = args;\n const {a, b,\n bias, preluActivationWeights} = inputs;\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n\n return batchMatMulImpl({\n a,\n b,\n transposeA,\n transposeB,\n backend,\n bias,\n preluActivationWeights,\n leakyreluAlpha,\n activation\n });\n}\n\nexport const _fusedMatMulConfig:\n KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'webgl',\n kernelFunc: _fusedMatMul as {} as\n KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *

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=====\n
*/\n\nimport {Acos, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n './kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\nconst ACOS =\n CHECK_NAN_SNIPPET +`\n if (abs(x) > 1.) {\n return NAN;\n }\n return acos(x);`\n\nexport const acos =\n unaryKernelFunc({opSnippet: ACOS});\n\nexport const acosConfig: KernelConfig = {\n kernelName: Acos,\n backendName: 'webgl',\n kernelFunc: acos,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {Acosh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n './kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\nconst ACOSH =\n CHECK_NAN_SNIPPET +`\n if (x < 1.0) return NAN;\n return log(x + sqrt(x * x - 1.0));`\n\nexport const acosh =\n unaryKernelFunc({opSnippet: ACOSH});\n\nexport const acoshConfig: KernelConfig = {\n kernelName: Acosh,\n backendName: 'webgl',\n kernelFunc: acosh,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class AddNProgram implements GPGPUProgram\n {\n variableNames: string[];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(outputShape:\n number[], shapes: number[][])\n {\n this.outputShape = outputShape;\n this.variableNames = shapes.map((_, i) =>\n `T${i}`);\n\n const snippets: string[] = [];\n // Get target elements from every input tensor.\n this.variableNames.forEach(variable => {\n snippets.push(`float v${variable} =\n get${variable}AtOutCoords();`);\n });\n\n // Calculate the sum of all elements.\n const operation =\n this.variableNames\n .map(variable => {\n return `v${variable}`;\n\n })\n .join(' + ');\n\n this.userCode =`\n void main() {\n ${snippets.join("\n\n")}\n\n float result = ${operation};\n setOutput(result);\n }\n `;\n}\n\n"/**\n * @license\n * Copyright 2019\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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=====  
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class AddNPackedProgram implements  
GPGPUProgram {\n  variableNames: string[];\n  outputShape: number[] = [];\n  userCode: string;\n  packedInputs =  
true;\n  packedOutput = true;\n\n  constructor(outputShape: number[], shapes: number[][]) {\n    this.outputShape =  
outputShape;\n    this.variableNames = shapes.map((_, i) => `T${i}`);\n\n    const snippets: string[] = [];\n    // Get  
target elements from every input tensor.\n    this.variableNames.forEach(variable => {\n      snippets.push(`vec4  
v${variable} = get${variable}AtOutCoords();`);\n    });\n\n    // Calculate the sum of all elements.\n    const  
operation = this.variableNames\n      .map(variable => {\n        return `v${variable}`;\n      })\n      .join(' + ');\n\n    this.userCode = `\n    void main() {\n      ${snippets.join("\n")}\n      vec4 result = ${operation};\n      setOutput(result);\n    }`;\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the  
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or  
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n */
```

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=====  
*\n\nimport {AddN, AddNInputs, env, KernelConfig, KernelFunc, TensorInfo, upcastType} from  
"@tensorflow/tfjs-core";\n\nimport {AddNProgram} from './addn_gpu';\nimport {AddNPackedProgram} from  
"./addn_packed_gpu";\nimport {MathBackendWebGL} from './backend_webgl';\nimport {identity} from  
"./Identity";\n\nexport function addN(args: {inputs: AddNInputs, backend: MathBackendWebGL}):  
TensorInfo  
{\n  const {inputs, backend} = args;\n  const tensors = inputs;\n  if (tensors.length === 1) {\n    return  
identity({inputs: {x: tensors[0]}, backend});\n  }\n\n  // Limit the number of uploaded textures for optimization.\n  if  
(tensors.length > env().get("WEBGL_MAX_TEXTURES_IN_SHADER")) {\n    const midIndex =  
Math.floor(tensors.length / 2);\n    const leftSide = addN({inputs: tensors.slice(0, midIndex), backend});\n    const  
rightSide = addN({inputs: tensors.slice(midIndex), backend});\n    return addN({inputs: [leftSide, rightSide],  
backend});\n  }\n\n  const dtype =\n    tensors.map(t => t.dtype).reduce((d1, d2) => upcastType(d1, d2));\n  const  
shapes = tensors.map(t => t.shape);\n  // We can make sure shapes are identical in op level.\n  const usePackedOp =  
env().getBool("WEBGL_PACK");\n  const program = usePackedOp ?\n    new  
AddNPackedProgram(tensors[0].shape, shapes) :\n    new AddNProgram(tensors[0].shape, shapes);\n  return  
backend.runWebGLProgram(program, tensors, dtype);\n}\n\nexport const addNConfig: KernelConfig = {\n  kernelName: AddN,\n  backendName: 'webgl',\n  kernelFunc: addN as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the  
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or  
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from  
"@tensorflow/tfjs-core";\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {reduce} from  
"./kernel_utils/reduce";\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nexport  
function all(\n  args: {inputs: AllInputs, backend: MathBackendWebGL, attrs: AllAttrs}):  
TensorInfo  
{\n  const  
{inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis, keepDims} = attrs;\n\n  const xRank =
```



```

x.shape.length;\n\n const origAxes = util.parseAxisParam(axis, x.shape);\n let axes = origAxes;\n const
permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let permutedX = x;\n if (permutedAxes != null)
{\n  permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n  axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n }\n\n backend_util.assertAxesAreInnerMostDims('all',
axes, xRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n const inSize =
util.sizeFromShape(reduceShape);\n\n const a2D =\n  reshape({inputs: {x: permutedX}, backend, attrs: {shape:
[-1, inSize]}});\n const reduced = reduce(a2D, a2D.dtype, 'all', backend);\n\n let res;\n if (keepDims) {\n  const
newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n  res = reshape({inputs: {x: reduced},
backend, attrs: {shape: newShape}});\n } else {\n  res = reshape({inputs: {x: reduced}, backend, attrs: {shape:
outShape}});\n }\n\n backend.disposeIntermediateTensorInfo(a2D);\n
backend.disposeIntermediateTensorInfo(reduced);\n\n if (permutedAxes != null) {\n
backend.disposeIntermediateTensorInfo(permutedX);\n }\n\n return res;\n}\n\nexport const allConfig:
KernelConfig = {\n  kernelName: All,\n  backendName: 'webgl',\n  kernelFunc: all as {\n
KernelFunc\n};\n"},/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*/\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {reduce} from
'./kernel_utils/reduce';\n\nimport {reshape} from './Reshape';\n\nimport {transpose} from './Transpose';\n\nexport
function any(\n  args: {inputs: AnyInputs, backend: MathBackendWebGL, attrs: AnyAttrs}):\n  TensorInfo {\n
const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis, keepDims} = attrs;\n\n  const xRank =
x.shape.length;\n\n  const origAxes = util.parseAxisParam(axis, x.shape);\n  let axes = origAxes;\n  const
permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let permutedX = x;\n  if (permutedAxes != null)
{\n    permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n    axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n  }\n\n  backend_util.assertAxesAreInnerMostDims('any',
axes, xRank);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n  const inSize =
util.sizeFromShape(reduceShape);\n\n  const a2D =\n    reshape({inputs: {x: permutedX}, backend, attrs: {shape:
[-1, inSize]}});\n  const reduced = reduce(a2D, a2D.dtype, 'any', backend);\n\n  let res;\n  if (keepDims) {\n    const
newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n    res = reshape({inputs: {x: reduced},
backend, attrs: {shape: newShape}});\n  } else {\n    res = reshape({inputs: {x: reduced}, backend, attrs: {shape:
outShape}});\n  }\n\n  backend.disposeIntermediateTensorInfo(a2D);\n
backend.disposeIntermediateTensorInfo(reduced);\n\n  if (permutedAxes != null) {\n
backend.disposeIntermediateTensorInfo(permutedX);\n }\n\n  return res;\n}\n\nexport const anyConfig:
KernelConfig = {\n  kernelName: Any,\n  backendName: 'webgl',\n  kernelFunc: any as {\n
KernelFunc\n};\n"},/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class ArgMinMaxProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    reduceInfo: backend_util.ReduceInfo, op:
'max'|'min',\n    firstPass: boolean) {\n    const {windowSize, batchSize, outSize} = reduceInfo;\n    if (!firstPass)
{\n      this.variableNames.push('bestIndicesA');\n    }\n    this.outputShape = [batchSize, outSize];\n    const
compOp = (op === 'max') ? '>' : '<';\n    const indexSnippet = firstPass ? '\n    inOffset + i';\n
\n    round(getBestIndicesA(batch, inOffset + i));\n\n    this.userCode = `\n    void main() {\n      ivec2 coords =
getOutputCoords();\n      int batch = coords[0];\n      int outIdx = coords[1];\n      int inOffset = outIdx *
${windowSize};\n      int bestIndex = inOffset;\n      float bestValue = getA(batch, bestIndex);\n      for (int i
= 0; i < ${windowSize}; i++) {\n        int inIdx = ${indexSnippet};\n        float candidate = getA(batch, inIdx);\n
        if (candidate ${compOp} bestValue) {\n          bestValue = candidate;\n          bestIndex = inIdx;\n        }\n
      }\n      setOutput(float(bestIndex));\n    }\n  `;\n}\n\n}"/**\n * @license\n * Copyright 2019 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\nimport
{getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class
ArgMinMaxPackedProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n
  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(\n    shape: number[],
windowSize: number, op: 'max'|'min',\n    firstPass: boolean) {\n    util.assert(\n      shape.length > 2,\n      () =>
`Packed arg${\n      op.charAt(0).toUpperCase() +\n      op.slice(1)} supports only inputs with rank above
2.`);\n    const inSize = shape[shape.length - 1];\n    const outSize = Math.ceil(inSize / windowSize);\n
    this.outputShape = shape.slice(0, -1);\n    if (outSize > 1) {\n      this.outputShape.push(outSize);\n    }\n    if
(!firstPass) {\n      this.variableNames.push('bestIndicesA');\n    }\n    const outShape = this.outputShape;\n    const
rank = outShape.length;\n    const dtype = getCoordsDataType(rank);\n    const coords = getChannels('coords',
rank);\n\n    let sourceLocSetup;\n    let sourceRank;\n    if (outSize === 1) {\n      sourceRank = rank + 1;\n      const
sourceLocDType = getCoordsDataType(sourceRank);\n      sourceLocSetup = `\n      ${sourceLocDType}\n
      sourceLocR = ${sourceLocDType}(${coords.join()}), 0);\n      ++${coords[rank - 1]};\n      ${sourceLocDType}\n
      sourceLocG = ${sourceLocDType}(${coords.join()}), 0);\n      ++${coords[rank - 2]};\n      ${sourceLocDType}\n
      sourceLocA = ${sourceLocDType}(${coords.join()}), 0);\n      --${coords[rank - 1]};\n      ${sourceLocDType}\n
      sourceLocB = ${sourceLocDType}(${coords.join()}), 0);\n      --${coords[rank - 2]};`; \n    } else {\n
      sourceRank = rank;\n      sourceLocSetup = `\n      ${dtype} sourceLocR = coords;\n      ++${coords[rank - 1]};\n
      ${dtype} sourceLocG = coords;\n      ++${coords[rank - 2]};\n      ${dtype} sourceLocA = coords;\n      --
${coords[rank - 1]};\n      ${dtype} sourceLocB = coords;\n      --${coords[rank - 2]};`; \n    }\n    const channels =
['x', 'y', 'z', 'w', 'u', 'v'].slice(0, sourceRank);\n    const inChannel = '.' + channels[sourceRank - 1]; // e.g. ".b" for
rank 3.\n    const intChannels = channels.map(x => 'int ' + x);\n    const srcRCoords =\n
getChannels('sourceLocR', sourceRank - 1).concat('inIdx.r');\n    const srcGCoords =\n
getChannels('sourceLocG', sourceRank - 1).concat('inIdx.g');\n    const srcBCoords =\n
getChannels('sourceLocB', sourceRank - 1).concat('inIdx.b');\n    const srcACoords =\n
getChannels('sourceLocA', sourceRank - 1).concat('inIdx.a');\n\n    const compOp = (op === 'max') ? 'greaterThan' :
'lessThan';\n    const fetchCandidateIdx = firstPass ? '' : '\n    inIdx =
round(vec4(getBestIndicesAChannel(${srcRCoords.join()}),\n
getBestIndicesAChannel(${srcGCoords.join()}),\n

```

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getBestIndicesAChannel(${srcBCoords.join()}),\n
getBestIndicesAChannel(${srcACoords.join()}));\n\n const fetchValue = `vec4(\n
getAChannel(${srcRCoords.join()}),\n      hasNextCol ? getAChannel(${srcGCoords.join()}) : 0.,\n
hasNextRow ? getAChannel(${srcBCoords.join()}) : 0.,\n      hasNextRow && hasNextCol ?\n
getAChannel(${srcACoords.join()}) : 0.`;\n\n const getBestIndicesAChannelSnippet = firstPass ? " : "\n float\n
getBestIndicesAChannel(${intChannels.join()}) {\n      return getChannel(getBestIndicesA(${channels.join()}),\n
      vec2(${channels.slice(-2).join()}));\n  };\n\n this.userCode = `\n float\n
getAChannel(${intChannels.join()}) {\n      return getChannel(getA(${channels.join()}),\n
      vec2(${channels.slice(-2).join()}));\n  }\n  ${getBestIndicesAChannelSnippet}\n  void main() {\n
${dtype} coords = getOutputCoords();\n      bool hasNextCol = ${coords[rank - 1]} < ${outShape[rank - 1] - 1};\n
      bool hasNextRow = ${coords[rank - 2]} < ${outShape[rank - 2] - 1};\n      ${sourceLocSetup}\n      ivec4\n
srcIdx = ivec4(sourceLocR${inChannel}, sourceLocG${inChannel},\n      sourceLocB${inChannel},\n
sourceLocA${inChannel}) * ${windowSize};\n      ivec4 inIdx = srcIdx;\n      vec4 bestIndex = vec4(inIdx);\n
      vec4 bestValue = ${fetchValue};\n      for (int i = 0; i < ${windowSize}; i++) {\n          inIdx = srcIdx;\n
${fetchCandidateIdx}\n          vec4 candidate = ${fetchValue};\n          bvec4 nan = isnan(candidate);\n          bvec4\n
replace = bvec4(\n              vec4(${compOp}(candidate, bestValue)) * (vec4(1.0) - vec4(nan));\n          bestValue =\n
vec4(replace.x ? candidate.x : bestValue.x,\n              replace.y ? candidate.y : bestValue.y,\n
              replace.z ? candidate.z : bestValue.z,\n              replace.w ? candidate.w : bestValue.w);\n          bestIndex\n
= mix(bestIndex, vec4(inIdx), vec4(replace));\n          srcIdx++;\n          }\n      setOutput(bestIndex);\n  }\n  `;\n
}\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {ArgMinMaxProgram}\n
from './argminmax_gpu';\nimport {ArgMinMaxPackedProgram} from './argminmax_packed_gpu';\nimport\n
{MathBackendWebGL} from './backend_webgl';\nimport {reshape} from './kernels/Reshape';\n\nfunction\n
argReduce(\n  backend: MathBackendWebGL, x: TensorInfo, reduceType: 'max'|'min',\n  bestIndicesA:\n
TensorInfo = null): TensorInfo {\n  let batchSize = x.shape[0];\n  let inSize = x.shape[1];\n  if (bestIndicesA != null)\n
{\n    batchSize = bestIndicesA.shape[0];\n    inSize = bestIndicesA.shape[1];\n  }\n  const windowSize =\n
backend_util.computeOptimalWindowSize(inSize);\n  const reduceInfo =\n    {windowSize, inSize, batchSize,\n
  outSize: Math.ceil(inSize / windowSize)};\n  const program =\n    new ArgMinMaxProgram(reduceInfo,\n
  reduceType, bestIndicesA == null);\n  const inputs = [x];\n  if (bestIndicesA != null) {\n
  inputs.push(bestIndicesA);\n  }\n  const output = backend.runWebGLProgram(program, inputs, 'int32');\n  // No\n
need to run another GPGPU program.\n  if (output.shape[1] === 1) {\n    return output;\n  }\n  const result =\n
argReduce(backend, x, reduceType, output);\n  backend.disposeIntermediateTensorInfo(output);\n  return\n
result;\n}\n\nfunction argReducePacked(\n  backend: MathBackendWebGL, x: TensorInfo, reduceType:\n
'max'|'min',\n  bestIndicesA: TensorInfo = null): TensorInfo {\n  const inShape = bestIndicesA != null ?\n
bestIndicesA.shape : x.shape;\n  const inSize = inShape[inShape.length - 1];\n  const windowSize =\n
backend_util.computeOptimalWindowSize(inSize);\n  const program = new ArgMinMaxPackedProgram(\n
inShape, windowSize, reduceType, bestIndicesA == null);\n  const inputs = bestIndicesA == null ? [x] : [x,\n
bestIndicesA];\n  const output = backend.runWebGLProgram(program, inputs, 'int32');\n  if (output.shape.length\n
=== x.shape.length) {\n    const result = argReducePacked(backend, x, reduceType, output);\n
  }\n  backend.disposeIntermediateTensorInfo(output);\n  return result;\n  }\n  return output;\n}\n\nexport function\n
argMinMaxReduce(\n  backend: MathBackendWebGL, x: TensorInfo, axis: number,\n  reduceType: 'min'|'max'):\n
TensorInfo {\n  const axes = [axis];\n  backend_util.assertAxesAreInnerMostDims(\n    'arg' +

```

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reduceType.charAt(0).toUpperCase() + reduceType.slice(1), axes,\n    x.shape.length);\n if
(!env().getBool('WEBGL_PACK_REDUCE') || x.shape.length <= 2) {\n  const intermediateTensorInfos = [];\n
const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(x.shape, axes);\n  const inSize
= util.sizeFromShape(reduceShape);\n  const a2D = reshape({inputs: {x}, backend, attrs: {shape: [-1, inSize]}});\n
intermediateTensorInfos.push(a2D);\n\n  const reduced = argReduce(backend, a2D, reduceType);\n
intermediateTensorInfos.push(reduced);\n  const reshaped =\n  reshape({inputs: {x: reduced}, backend, attrs:
{shape: outShape}});\n\n  intermediateTensorInfos.forEach(\n    t =>
backend.disposeIntermediateTensorInfo(t);\n  return reshaped;\n }\n return argReducePacked(backend, x,
reduceType);\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util }
from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from '../backend_webgl';\nimport
{ argMinMaxReduce } from '../kernel_utils/arg_min_max';\n\nimport { transpose } from './Transpose';\n\nexport
function argMax(\n  args:\n    {inputs: ArgMaxInputs, backend: MathBackendWebGL, attrs: ArgMaxAttrs});\n
TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis} = attrs;\n  let axes =
util.parseAxisParam(axis, x.shape);\n  const permutedAxes = backend_util.getAxesPermutation(axes,
x.shape.length);\n  let $x = x;\n  const intermediateTensorInfos = [];\n  if (permutedAxes != null) {\n    $x =
transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n    intermediateTensorInfos.push($x);\n    axes =
backend_util.getInnerMostAxes(axes.length, $x.shape.length);\n  }\n\n  backend_util.assertAxesAreInnerMostDims('argMax', [axes[0]], $x.shape.length);\n  const out =
argMinMaxReduce(backend, $x, axes[0], 'max');\n\n  intermediateTensorInfos.forEach(\n    t =>
backend.disposeIntermediateTensorInfo(t);\n  return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n
kernelName: ArgMax,\n  backendName: 'webgl',\n  kernelFunc: argMax as {} as KernelFunc\n};\n\n", "/*\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport { ArgMin, ArgMinAttrs, ArgMinInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util }
from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from '../backend_webgl';\nimport
{ argMinMaxReduce } from '../kernel_utils/arg_min_max';\n\nimport { transpose } from './Transpose';\n\nexport
function argMin(\n  args:\n    {inputs: ArgMinInputs, backend: MathBackendWebGL, attrs: ArgMinAttrs});\n
TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis} = attrs;\n  let axes =
util.parseAxisParam(axis, x.shape);\n  const permutedAxes = backend_util.getAxesPermutation(axes,
x.shape.length);\n  let $x = x;\n  const intermediateTensorInfos = [];\n  if (permutedAxes != null) {\n    $x =
transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n    intermediateTensorInfos.push($x);\n    axes =
backend_util.getInnerMostAxes(axes.length, $x.shape.length);\n  }\n\n  backend_util.assertAxesAreInnerMostDims('argMin', [axes[0]], $x.shape.length);\n  const out =
argMinMaxReduce(backend, $x, axes[0], 'min');\n\n  intermediateTensorInfos.forEach(\n    t =>
backend.disposeIntermediateTensorInfo(t);\n  return out;\n}\n\nexport const argMinConfig: KernelConfig = {\n

```

kernelName: ArgMin,\n backendName: 'webgl',\n kernelFunc: argMin as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Asin, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\nconst ASIN =\n CHECK_NAN_SNIPPET +`\n if (abs(x) > 1.) {\n return NAN;\n }\n return asin(x);\n`;\n\nexport const asin =\n unaryKernelFunc({opSnippet: ASIN});\n\nexport const asinConfig: KernelConfig = {\n kernelName: Asin,\n backendName: 'webgl',\n kernelFunc: asin,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Asinh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\nconst ASINH =\n CHECK_NAN_SNIPPET +`return log(x + sqrt(x * x + 1.0));`\n\nexport const asinh =\n unaryKernelFunc({opSnippet: ASINH});\n\nexport const asinhConfig: KernelConfig = {\n kernelName: Asinh,\n backendName: 'webgl',\n kernelFunc: asinh,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Atan, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\nconst ATAN =\n CHECK_NAN_SNIPPET +`\n return atan(x);\n`;\n\nexport const atan = unaryKernelFunc({opSnippet:\n ATAN});\n\nexport const atanConfig: KernelConfig = {\n kernelName: Atan,\n backendName: 'webgl',\n kernelFunc: atan,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
```

```
=====\n*\n\nimport {Atan2} from '@tensorflow/tfjs-core';\nimport {KernelConfig} from '@tensorflow/tfjs-\n core';\nimport {binaryKernelFunc, CHECK_NAN_SNIPPET_BINARY,\n CHECK_NAN_SNIPPET_BINARY_PACKED} from '../kernel_utils/kernel_funcs_utils';\nconst ATAN2 =\n CHECK_NAN_SNIPPET_BINARY +`\n return atan(a, b);\n`;\nconst ATAN2_PACKED =`\n vec4 result =
```

```

atan(a, b);\n  vec4 isNaN = min(vec4(isnan(a)) + vec4(isnan(b)), vec4(1.0));\n  ` +\n
CHECK_NAN_SNIPPET_BINARY_PACKED + `\n  return result;\n`; \n\nexport const atan2 =\n
binaryKernelFunc({opSnippet: ATAN2, packedOpSnippet: ATAN2_PACKED});\n\nexport const atan2Config:\n
KernelConfig = {\n  kernelName: Atan2,\n  backendName: 'webgl',\n  kernelFunc: atan2,\n};\n", "/**\n * @license\n
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the specific language governing permissions and\n * limitations under the License.\n *  

=====\n
*/\n\nimport {Atanh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from\n
'./kernel_utils/kernel_funcs_utils';\n\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\n\nconst ATANH =\n
CHECK_NAN_SNIPPET + `\n  if ((x < -1.0) || (x > 1.0)) return NaN;\n  return (log(1.0 + x) - log(1.0 - x)) /  

2.0;`\n\nexport const atanh = unaryKernelFunc({opSnippet: ATANH});\n\nexport const atanhConfig: KernelConfig\n
= {\n  kernelName: Atanh,\n  backendName: 'webgl',\n  kernelFunc: atanh,\n};\n", "/**\n * @license\n
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
*\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES  

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  

governing permissions and\n * limitations under the License.\n *  

=====\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from\n
'./gpgpu_math';\n\nexport class Pool2DProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    convInfo: backend_util.Conv2DInfo, poolType:\n
'max'|'avg',\n    computePositions: boolean, flattenPositions = false,\n    includeBatchInIndex = false) {\n    if\n
(poolType === 'avg' && computePositions) {\n      throw new Error('Cannot compute positions for average  

pool.);\n    }\n    const filterWidth = convInfo.filterWidth;\n    const strideHeight = convInfo.strideHeight;\n
const strideWidth = convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const  

dilationWidth = convInfo.dilationWidth;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const  

effectiveFilterWidth = convInfo.effectiveFilterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padLeft\n
= convInfo.padInfo.left;\n    this.outputShape = convInfo.outShape;\n\n    const isAvgPool = poolType === 'avg';\n
const batchFlattenPositionStr = `((batch * ${convInfo.inHeight} + xR) * ${\n    convInfo.inWidth} + xC) *  

${convInfo.inChannels} + d`; \n    const flattenPositionStr = `(xR * ${convInfo.inWidth} + xC) *  

${convInfo.inChannels} + d`; \n    let initializationValue = '0.0'; \n    if (!isAvgPool) {\n      // WebGL on Firefox  

Linux can't compile 1/0 so we do 1/eps.\n      initializationValue = '-1.0 / 1e-20'; \n    }\n    if (computePositions)\n
{\n      const compareOp = '>='; \n      this.userCode = `\n      const ivec2 strides = ivec2(${strideHeight},  

${strideWidth}); \n      const ivec2 pads = ivec2(${padTop}, ${padLeft}); \n      void main() {\n        ivec4  

coords = getOutputCoords(); \n        int batch = coords[0]; \n        int d = coords[3]; \n\n        ivec2 xRCCorner =  

coords.yz * strides - pads; \n        int xRCorner = xRCCorner.x; \n        int xCCorner = xRCCorner.y; \n\n        //  

max/min x(?, ?, d) to get y(yR, yC, d).\n        // ? = to be determined\n        float minMaxValue = 0.0; \n        float  

minMaxValueFound = 0.0; \n        int minMaxPosition = 0; \n        float avgValue = 0.0; \n\n        for (int wR = 0;  

wR < ${effectiveFilterHeight}; \n          wR += ${dilationHeight}) {\n          int xR = xRCorner + wR; \n\n          if (xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue; \n          } \n          for (int wC = 0; wC <  

${effectiveFilterWidth}; \n            wC += ${dilationWidth}) {\n            int xC = xCCorner + wC; \n\n            if  

(xC < 0 || xC >= ${convInfo.inWidth}) {\n              continue; \n            } \n            float value = getX(batch, xR,  

xC, d); \n\n            // If a min / max value has already been found, use it. If not, \n            // use the current value. \n

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float currMinMaxValue = mix(\n                value, minMaxValue, minMaxValueFound);\n        if (value
${compareOp} currMinMaxValue) {\n                minMaxValue = value;\n                minMaxValueFound = 1.0;\n                minMaxPosition = ${\n                flattenPositions ? (includeBatchInIndex ? batchFlattenPositionStr :\n                                flattenPositionStr) :\n                                `wR * ${effectiveFilterWidth} + wC`;}\n                }\n        }\n        setOutput(float(minMaxPosition));\n        }\n        `;\n        return;\n        }\n        const compareOp =
'max';\n        let returnValue = `${poolType}${poolType}${poolType}C +\n        minMaxValue[0],
minMaxValue[1], minMaxValue[2], minMaxValue[3]`;
if (poolType === 'avg') {\n        returnValue =
`avgValue / count`;
}\n        const filterWidthNearestVec4 = Math.floor(filterWidth / 4) * 4;\n        const
filterWidthVec4Remainder = filterWidth % 4;\n        const updateSnippet = \n        if (${isAvgPool}) {\n
avgValue += dot(values, ones);\n        } else {\n        minMaxValue = ${compareOp}(values, minMaxValue);\n
}\n        `;\n        this.userCode = \n        const ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n        const ivec2
pads = ivec2(${padTop}, ${padLeft});\n        const float initializationValue = ${initializationValue};\n        const vec4
ones = vec4(1.0, 1.0, 1.0, 1.0);\n        float count = 0.0;\n        float getValue(int batch, int xR, int xC, int d) {\n
if (xC < 0 || xC >= ${convInfo.inWidth}) {\n        return initializationValue;\n        }\n        count += 1.0;\n
return getX(batch, xR, xC, d);\n        }\n        void main() {\n        ivec4 coords = getOutputCoords();\n        int batch
= coords[0];\n        int d = coords[3];\n        ivec2 xRCCorner = coords.yz * strides - pads;\n        int xRCorner =
xRCCorner.x;\n        int xCCorner = xRCCorner.y;\n        // max/min x(?, ?, d) to get y(yR, yC, d).\n        // ? = to
be determined\n        vec4 minMaxValue = vec4(${initializationValue});\n        float avgValue = 0.0;\n        count =
0.0;\n        for (int wR = 0; wR < ${effectiveFilterHeight}; wR += ${dilationHeight}) {\n        int xR =
xRCorner + wR;\n        if (xR < 0 || xR >= ${convInfo.inHeight}) {\n        continue;\n        }\n        for (int
wC = 0; wC < ${filterWidthNearestVec4}; wC += 4) {\n        int xC = xCCorner + wC * ${dilationWidth};\n        \n
vec4 values = vec4(\n                getValue(batch, xR, xC, d),\n                getValue(batch, xR, xC +
${dilationWidth}, d),\n                getValue(batch, xR, xC + 2 * ${dilationWidth}, d),\n                getValue(batch, xR,
xC + 3 * ${dilationWidth}, d)\n                );\n                ${updateSnippet}\n                }\n                int xC = xCCorner +
${filterWidthNearestVec4};\n                if (${filterWidthVec4Remainder === 1}) {\n                vec4 values = vec4(\n
                getValue(batch, xR, xC, d),\n                initializationValue,\n                initializationValue,\n
initializationValue\n                );\n                ${updateSnippet}\n                } else if (${filterWidthVec4Remainder === 2})
{\n                vec4 values = vec4(\n                getValue(batch, xR, xC, d),\n                getValue(batch, xR, xC +
${dilationWidth}, d),\n                initializationValue,\n                initializationValue\n                );\n                \n
${updateSnippet}\n                } else if (${filterWidthVec4Remainder === 3}) {\n                vec4 values = vec4(\n
                getValue(batch, xR, xC, d),\n                getValue(batch, xR, xC + ${dilationWidth}, d),\n                getValue(batch, xR,
xC + 2 * ${dilationWidth}, d),\n                initializationValue\n                );\n                ${updateSnippet}\n                }\n
}\n        setOutput(${returnValue});\n        }\n        `;\n        }\n}\n\nexport class Pool3DProgram implements
GPGPUProgram {\n        variableNames = ['x'];\n        outputShape: number[];\n        userCode: string;\n        constructor(\n
convInfo: backend_util.Conv3DInfo, poolType: 'max'|'avg',\n        computePositions: boolean, flattenPositions =
false,\n        includeBatchInIndex = false) {\n        if (poolType === 'avg' && computePositions) {\n        throw new
Error('Cannot compute positions for average pool.);\n        }\n        const filterWidth = convInfo.filterWidth;\n        const
strideDepth = convInfo.strideDepth;\n        const strideHeight = convInfo.strideHeight;\n        const strideWidth =
convInfo.strideWidth;\n        const dilationDepth = convInfo.dilationDepth;\n        const dilationHeight =
convInfo.dilationHeight;\n        const dilationWidth = convInfo.dilationWidth;\n        const effectiveFilterDepth =
convInfo.effectiveFilterDepth;\n        const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n        const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n        const padFront = convInfo.padInfo.front;\n        const
padTop = convInfo.padInfo.top;\n        const padLeft = convInfo.padInfo.left;\n        this.outputShape =
convInfo.outShape;\n        const isAvgPool = poolType === 'avg';\n        let initializationValue = '0.0';\n        if
(!isAvgPool) {\n        // WebGL on Firefox Linux can't compile 1/0 so we do 1/eps.\n        initializationValue = '-1.0 /
1e-20';\n        }\n        if (computePositions) {\n        const compareOp = '>=';\n        this.userCode = \n        const ivec3
strides =\n        ivec3(${strideDepth}, ${strideHeight}, ${strideWidth});\n        const ivec3 pads =
ivec3(${padFront}, ${padTop}, ${padLeft});\n        void main() {\n        ivec5 coords = getOutputCoords();\n

```

```

    int batch = coords.x;\n        int ch = coords.u;\n\n        ivec3 xCorner = ivec3(coords.y, coords.z, coords.w) *
strides - pads;\n        int xDCorner = xCorner.x;\n        int xRCorner = xCorner.y;\n        int xCCorner =
xCorner.z;\n\n        // max/min x(?, ?, ?, ch) to get y(yD, yR, yC, ch).\n        // ? = to be determined\n        float
minMaxValue = 0.0;\n        float minMaxValueFound = 0.0;\n        int minMaxPosition = 0;\n\n        for (int wD
= 0; wD < ${effectiveFilterDepth};\n            wD += ${dilationDepth}) {\n            int xD = xDCorner + wD;\n\n
            if (xD < 0 || xD >= ${convInfo.inDepth}) {\n                continue;\n            }\n\n            for (int wR = 0; wR <
${effectiveFilterHeight};\n                wR += ${dilationHeight}) {\n                int xR = xRCorner + wR;\n\n                if
(xR < 0 || xR >= ${convInfo.inHeight}) {\n                    continue;\n                }\n\n                for (int wC = 0; wC <
${effectiveFilterWidth};\n                    wC += ${dilationWidth}) {\n                    int xC = xCCorner + wC;\n\n
                    if (xC < 0 || xC >= ${convInfo.inWidth}) {\n                        continue;\n                    }\n\n
                    float value =
getX(batch, xD, xR, xC, ch);\n\n                    // If a min / max value has already been found, use it. If not,\n                    //
                    use the current value.\n                    float currMinMaxValue = mix(\n                        value, minMaxValue,
minMaxValueFound);\n                    if (value ${compareOp} currMinMaxValue) {\n                        minMaxValue =
value;\n                        minMaxValueFound = 1.0;\n                        minMaxPosition = ${\n                            flattenPositions ?\n
(includeBatchInIndex ?\n                                `((batch * ${convInfo.inDepth} + xD) * ${\n
convInfo.inHeight} + xR) * ${convInfo.inWidth} + xC) * ${\n
convInfo.inChannels} + ch` :\n                                `(xD * ${convInfo.inHeight} + xR) * ${\n
convInfo.inWidth} + xC) * ${convInfo.inChannels} +
ch`)\n                            :\n                            `wD * ${effectiveFilterHeight} * ${effectiveFilterWidth} +\n
wR *
${effectiveFilterWidth} + wC`);\n                    }\n\n                    }\n                }\n            }\n
            setOutput(float(minMaxPosition));\n        }\n        return;\n    }\n\n    const compareOp = 'max';\n\n    let
returnValue = `${poolType}(${poolType})(${poolType})` +\n        'minMaxValue[0], minMaxValue[1],
minMaxValue[2]), minMaxValue[3]';\n    if (poolType === 'avg') {\n        returnValue = `avgValue / count`;\n
    }\n\n    const filterWidthNearestVec4 = Math.floor(filterWidth / 4) * 4;\n    const filterWidthVec4Remainder =
filterWidth % 4;\n\n    const updateSnippet = `\n        if (${isAvgPool}) {\n            avgValue += dot(values, ones);\n
        }\n    `;\n\n    this.userCode = `\n    const ivec3 strides =\n        ivec3(${strideDepth}, ${strideHeight}, ${strideWidth});\n    const ivec3 pads =
ivec3(${padFront}, ${padTop}, ${padLeft});\n    const float initializationValue = ${initializationValue};\n
    const vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n    float count = 0.0;\n\n    float getValue(int batch, int xD, int xR, int
xC, int ch) {\n        if (xC < 0 || xC >= ${convInfo.inWidth}) {\n            return initializationValue;\n        }\n
        count += 1.0;\n        return getX(batch, xD, xR, xC, ch);\n    }\n\n    void main() {\n        ivec5 coords =
getOutputCoords();\n        int batch = coords.x;\n        int ch = coords.u;\n\n        ivec3 xCorner = ivec3(coords.y,
coords.z, coords.w) * strides - pads;\n        int xDCorner = xCorner.x;\n        int xRCorner = xCorner.y;\n        int
xCCorner = xCorner.z;\n\n        // max/min x(?, ?, ?, d) to get y(yD, yR, yC, ch).\n        // ? = to be determined\n
        vec4 minMaxValue = vec4(${initializationValue});\n        float avgValue = 0.0;\n        count = 0.0;\n\n        for (int
wD = 0; wD < ${effectiveFilterDepth};\n            wD += ${dilationDepth}) {\n            int xD = xDCorner + wD;\n\n
            if (xD < 0 || xD >= ${convInfo.inDepth}) {\n                continue;\n            }\n\n            for (int wR = 0; wR <
${effectiveFilterHeight};\n                wR += ${dilationHeight}) {\n                int xR = xRCorner + wR;\n\n                if
(xR < 0 || xR >= ${convInfo.inHeight}) {\n                    continue;\n                }\n\n                for (int wC = 0; wC <
${filterWidthNearestVec4}; wC += 4) {\n                int xC = xCCorner + wC * ${dilationWidth};\n\n                vec4
values = vec4(\n                    getValue(batch, xD, xR, xC, ch),\n                    getValue(batch, xD, xR, xC +
${dilationWidth}, ch),\n                    getValue(batch, xD, xR, xC + 2 * ${dilationWidth}, ch),\n
                    getValue(batch, xD, xR, xC + 3 * ${dilationWidth}, ch)\n                );\n\n                ${updateSnippet}\n            }\n\n
            int xC = xCCorner + ${filterWidthNearestVec4};\n            if (${filterWidthVec4Remainder} === 1) {\n
                vec4 values = vec4(\n                    getValue(batch, xD, xR, xC, ch),\n                    initializationValue,\n
                    initializationValue,\n                    initializationValue\n                );\n\n                ${updateSnippet}\n            }\n
            } else if
(${filterWidthVec4Remainder} === 2) {\n                vec4 values = vec4(\n                    getValue(batch, xD, xR, xC,
ch),\n                    getValue(batch, xD, xR, xC + ${dilationWidth}, ch),\n                    initializationValue,\n
                    initializationValue\n                );\n\n                ${updateSnippet}\n            }\n            } else if
(${filterWidthVec4Remainder} ===

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3}) {\n      vec4 values = vec4(\n          getValue(batch, xD, xR, xC, ch),\n          getValue(batch, xD, xR,\nxC + ${dilationWidth}, ch),\n          getValue(batch, xD, xR, xC + 2 * ${dilationWidth}, ch),\n          initializationValue\n      );\n      ${updateSnippet}\n  }\n  }\n  setOutput(${returnValue});\n  }\n  }\n  `;\n  }\n  }\n  "/*\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *

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*\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util}\nfrom '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport\n{Pool2DProgram} from '../pool_gpu';\nimport {assertNotComplex} from '../webgl_util';\nimport {identity} from\n './Identity';\n\nexport function avgPool(args: {\n  inputs: AvgPoolInputs,\n  backend: MathBackendWebGL,\n  attrs:\n  AvgPoolAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  assertNotComplex(x, 'avgPool');\n  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const dilations =\n  1;\n  \n  util.assert(\n    backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n    () => 'Error in\n  avgPool: Either strides or dilations must be 1. '\n    `Got strides ${strides} and dilations '${dilations}'`);\n  \n  const convInfo = backend_util.computePool2DInfo(\n    x.shape as [number, number, number, number], filterSize,\n    strides,\n    dilations, pad, dimRoundingMode);\n  if (convInfo.filterWidth === 1 && convInfo.filterHeight === 1\n    &&\n    util.arraysEqual(convInfo.inShape, convInfo.outShape)) {\n    return identity({inputs: {x}, backend});\n  }\n  \n  const avgPoolProgram = new Pool2DProgram(convInfo, 'avg', false);\n  return\n  backend.runWebGLProgram(avgPoolProgram, [x], 'float32');\n}\n\nexport const avgPoolConfig: KernelConfig =\n{\n  kernelName: AvgPool,\n  backendName: 'webgl',\n  kernelFunc: avgPool as {} as KernelFunc\n};\n\n"/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n  copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n  the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {AvgPool3D, AvgPool3DAttrs, AvgPool3DInputs, backend_util, KernelConfig, KernelFunc,\nTensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport\n{Pool3DProgram} from '../pool_gpu';\n\nexport function avgPool3D(args: {\n  inputs: AvgPool3DInputs,\n  backend: MathBackendWebGL,\n  attrs: AvgPool3DAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =\n  args;\n  const {x} = inputs;\n  const {filterSize, strides, pad, dimRoundingMode, dataFormat} = attrs;\n  const\n  dilations: [number, number, number] = [1, 1, 1];\n  \n  const convInfo = backend_util.computePool3DInfo(\n    x.shape as [number, number, number, number, number], filterSize, strides,\n    dilations, pad, dimRoundingMode,\n    dataFormat);\n  const avgPoolProgram = new Pool3DProgram(convInfo, 'avg', false);\n  return\n  backend.runWebGLProgram(avgPoolProgram, [x], 'float32');\n}\n\nexport const avgPool3DConfig: KernelConfig =\n{\n  kernelName: AvgPool3D,\n  backendName: 'webgl',\n  kernelFunc: avgPool3D as {} as\n  KernelFunc\n};\n\n"/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the\n  Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n  law or agreed to in writing, software\n * distributed under the License is distributed\n  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n * limitations under the

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License.\n *

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*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class AvgPool2DBackpropProgram implements GPGPUProgram {\n  variableNames =
['dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.inShape;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth =
convInfo.dilationWidth;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n    const padTop = effectiveFilterHeight - 1 -
convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const avgMultiplier
= 1 / (filterHeight * filterWidth);\n\n    this.userCode = `\n    const ivec2 pads = ivec2(${padTop}, ${padLeft});\n    const
float avgMultiplier = float(${avgMultiplier});\n\n    void main() {\n      ivec4 coords =
getOutputCoords();\n      int b = coords[0];\n      int d = coords[3];\n      ivec2 dyRCCorner = coords.yz -
pads;\n      int dyRCorner = dyRCCorner.x;\n      int dyCCorner = dyRCCorner.y;\n      // Convolve dy(?, ?, d)
with pos mask(:, :, d) to get dx(xR, xC, d).\n      // ? = to be determined. := across all values in that axis.\n      float
dotProd = 0.0;\n      for (int wR = 0; wR < ${effectiveFilterHeight};\n          wR += ${dilationHeight}) {\n
float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n          if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||
fract(dyR) > 0.0) {\n            continue;\n          }\n          int idyR = int(dyR);\n          for (int wC = 0; wC <
${effectiveFilterWidth};\n              wC += ${dilationWidth}) {\n                float dyC = float(dyCCorner + wC) /
${strideWidth}.0;\n                if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n                    fract(dyC) > 0.0) {\n
continue;\n                }\n                int idyC = int(dyC);\n                float dyValue = getDy(b, idyR, idyC, d);\n                dotProd += dyValue * avgMultiplier;\n              }\n            }\n            setOutput(dotProd);\n          }\n        }\n\n\nexport
class AvgPool3DBackpropProgram implements GPGPUProgram {\n  variableNames = ['dy'];\n  outputShape:
number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape =
convInfo.inShape;\n    const filterDepth = convInfo.filterDepth;\n    const filterHeight = convInfo.filterHeight;\n
const filterWidth = convInfo.filterWidth;\n    const strideDepth = convInfo.strideDepth;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationDepth =
convInfo.dilationDepth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth =
convInfo.dilationWidth;\n    const effectiveFilterDepth = convInfo.effectiveFilterDepth;\n    const
effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const effectiveFilterWidth =
convInfo.effectiveFilterWidth;\n\n    const padFront = effectiveFilterDepth - 1 - convInfo.padInfo.front;\n    const
padTop = effectiveFilterHeight - 1 - convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 -
convInfo.padInfo.left;\n\n    const avgMultiplier = 1 / (filterDepth * filterHeight * filterWidth);\n\n    this.userCode
= `\n    const ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n    const float avgMultiplier =
float(${avgMultiplier});\n\n    void main() {\n      ivec5 coords = getOutputCoords();\n      int batch = coords.x;\n
      int ch = coords.u;\n      ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w) - pads;\n      int dyDCorner =
dyCorner.x;\n      int dyRCorner = dyCorner.y;\n      int dyCCorner = dyCorner.z;\n      // Convolve dy(?, ?, ?,
d) with pos mask(:, :, :, ch) to get\n      // dx(xD, xR, xC, ch).\n      // ? = to be determined. := across all values in
that axis.\n      float dotProd = 0.0;\n      for (int wD = 0; wD < ${effectiveFilterDepth};\n          wD +=
${dilationDepth}) {\n        float dyD = float(dyDCorner + wD) / ${strideDepth}.0;\n        if (dyD < 0.0 || dyD
>= ${convInfo.outDepth}.0 || fract(dyD) > 0.0) {\n          continue;\n        }\n        int idyD = int(dyD);\n
for (int wR = 0; wR < ${effectiveFilterHeight};\n            wR += ${dilationHeight}) {\n              float dyR =
float(dyRCorner + wR) / ${strideHeight}.0;\n              if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||\n
fract(dyR) > 0.0) {\n                continue;\n              }\n              int idyR = int(dyR);\n              for (int wC = 0; wC <
${effectiveFilterWidth};\n                  wC += ${dilationWidth}) {\n                    float dyC = float(dyCCorner + wC) /
${strideWidth}.0;\n                    if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n                        fract(dyC) > 0.0) {\n
continue;\n                    }\n                    int idyC = int(dyC);\n                    float dyValue = getDy(batch, idyD, idyR,
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idyC, ch);\n\n        dotProd += dyValue * avgMultiplier;\n        }\n    }\n}\n
setOutput(dotProd);\n    }\n    `;\n    }\n}\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\nimport {AvgPool3DGrad, AvgPool3DGradAttrs, AvgPool3DGradInputs, backend_util, KernelConfig,
KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {AvgPool3DBackpropProgram} from
'./avg_pool_backprop_gpu';\nimport {MathBackendWebGL} from './backend_webgl';\n\nexport function
avgPool3DGrad(args: {\n  inputs: AvgPool3DGradInputs,\n  backend: MathBackendWebGL,\n  attrs:
AvgPool3DGradAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {dy, input} = inputs;\n
const x = input;\n  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const dilations: [number, number,
number] = [1, 1, 1];\n\n  const convInfo = backend_util.computePool3DInfo(\n    x.shape as [number, number,
number, number, number, number], filterSize, strides,\n    dilations, pad, dimRoundingMode);\n  const
avgPoolBackpropProgram = new AvgPool3DBackpropProgram(convInfo);\n  return
backend.runWebGLProgram(avgPoolBackpropProgram, [dy], x.dtype);\n}\n\nexport const avgPoolGrad3DConfig:
KernelConfig = {\n  kernelName: AvgPool3DGrad,\n  backendName: 'webgl',\n  kernelFunc: avgPool3DGrad as {}
as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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\n
*\nimport {AvgPoolGrad, AvgPoolGradAttrs, AvgPoolGradInputs, backend_util, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {AvgPool2DBackpropProgram} from
'./avg_pool_backprop_gpu';\nimport {MathBackendWebGL} from './backend_webgl';\nimport
{assertNotComplex} from './webgl_util';\n\nexport function avgPoolGrad(args: {\n  inputs: AvgPoolGradInputs,\n
backend: MathBackendWebGL,\n  attrs: AvgPoolGradAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {dy, input} = inputs;\n  const x = input;\n  assertNotComplex([dy, input], 'avgPoolGrad');\n  const
{filterSize, strides, pad} = attrs;\n\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape as [number,
number, number, number], filterSize, strides,\n    1 /* dilations */, pad);\n  const avgPoolBackpropProgram = new
AvgPool2DBackpropProgram(convInfo);\n  return backend.runWebGLProgram(avgPoolBackpropProgram, [dy],
x.dtype);\n}\n\nexport const avgPoolGradConfig: KernelConfig = {\n  kernelName: AvgPoolGrad,\n
backendName: 'webgl',\n  kernelFunc: avgPoolGrad as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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\n
*\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc} from
'@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {batchMatMulImpl}

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from './BatchMatMul_impl';\n\nexport function batchMatMul(args: {\n  inputs: BatchMatMulInputs,\n  attrs: BatchMatMulAttrs,\n  backend: MathBackendWebGL\n}) {\n  const {inputs, backend, attrs} = args;\n  const {a, b} = inputs;\n  const {transposeA, transposeB} = attrs;\n\n  return batchMatMulImpl({a, b, transposeA, transposeB, backend});\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n  kernelName: BatchMatMul,\n  backendName: 'webgl',\n  kernelFunc: batchMatMul as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class BatchNormProgram implements GPGPUProgram {\n  variableNames: string[];\n  outputShape: number[] = [];\n  userCode: string;\n\n  constructor(\n    xShape: number[], meanShape: number[],\n    varianceShape: number[],\n    offsetShape: number[]|null, scaleShape: number[]|null,\n    varianceEpsilon: number) {\n    this.variableNames = ['x', 'mean', 'variance'];\n    backend_util.assertAndGetBroadcastShape(xShape, meanShape);\n    backend_util.assertAndGetBroadcastShape(xShape, varianceShape);\n\n    let offsetSnippet = '0.0';\n    if (offsetShape != null) {\n      backend_util.assertAndGetBroadcastShape(xShape, offsetShape);\n      this.variableNames.push('offset');\n      offsetSnippet = 'getOffsetAtOutCoords()';\n    }\n\n    let scaleSnippet = '1.0';\n    if (scaleShape != null) {\n      backend_util.assertAndGetBroadcastShape(xShape, scaleShape);\n      this.variableNames.push('scale');\n      scaleSnippet = 'getScaleAtOutCoords()';\n    }\n\n    this.outputShape = xShape;\n    this.userCode = `\n      void main() {\n        float x = getXAtOutCoords();\n        float mean = getMeanAtOutCoords();\n        float variance = getVarianceAtOutCoords();\n        float offset = ${offsetSnippet};\n        float scale = ${scaleSnippet};\n        float inv = scale * inversesqrt(variance + float(${varianceEpsilon}));\n        setOutput(dot(vec3(x, -mean, offset), vec3(inv, inv, 1)));\n      }\n    `;\n  }\n}\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class BatchNormPackedProgram implements GPGPUProgram {\n  variableNames: string[];\n  outputShape: number[];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(\n    xShape: number[], meanShape: number[], varianceShape: number[],\n    offsetShape: number[]|null, scaleShape: number[]|null,\n    varianceEpsilon: number) {\n    this.variableNames = ['x', 'mean', 'variance'];\n    backend_util.assertAndGetBroadcastShape(xShape, meanShape);\n    backend_util.assertAndGetBroadcastShape(xShape, varianceShape);\n\n    let offsetSnippet = 'vec4(0.0)';\n    if (offsetShape != null) {\n      backend_util.assertAndGetBroadcastShape(xShape, offsetShape);\n      this.variableNames.push('offset');\n      offsetSnippet = 'getOffsetAtOutCoords()';\n    }\n\n    let scaleSnippet = 'vec4(1.0)';\n    if (scaleShape != null) {\n      backend_util.assertAndGetBroadcastShape(xShape, scaleShape);\n      this.variableNames.push('scale');\n      scaleSnippet = 'getScaleAtOutCoords()';\n    }\n\n    this.outputShape = xShape;\n    this.userCode = `\n      void main() {\n        vec4 offset = ${offsetSnippet};\n        vec4 scale = ${scaleSnippet};\n        vec4 x = getXAtOutCoords();\n        vec4 mean = getMeanAtOutCoords();\n        vec4 variance = getVarianceAtOutCoords();\n        vec4 inv = scale * inversesqrt(variance +\n        vec4(${varianceEpsilon}));\n        setOutput((x - mean) * inv + offset);\n      }\n    `;\n  }\n}\n"/**\n *

```

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```
=====\n*\n\nimport {env, FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {BatchNormProgram} from '../batchnorm_gpu';\nimport {BatchNormPackedProgram} from '../batchnorm_packed_gpu';\n\nexport const batchNorm: (params: {\n  inputs: FusedBatchNormInputs,\n  backend: MathBackendWebGL,\n  attrs: FusedBatchNormAttrs\n}) => TensorInfo = ({inputs, backend, attrs}) => {\n  const {x, mean, variance, offset, scale} = inputs;\n  util.assert(\n    mean.shape.length === variance.shape.length,\n    () => 'Batch normalization gradient requires mean and variance to have '\n      +\n      'equal ranks.);\n  util.assert(\n    offset == null || mean.shape.length === offset.shape.length,\n    () => 'Batch normalization gradient requires mean and offset to have '\n      +\n      'equal ranks.);\n  util.assert(\n    scale == null || mean.shape.length === scale.shape.length,\n    () => 'Batch normalization gradient requires mean and scale to have '\n      +\n      'equal ranks.);\n  let {varianceEpsilon} = attrs;\n  if (varianceEpsilon == null) {\n    varianceEpsilon = 0.001;\n  }\n  const finalInputs = [x, mean, variance];\n  let offsetShape = null;\n  if (offset != null) {\n    offsetShape = offset.shape;\n    finalInputs.push(offset);\n  }\n  let scaleShape = null;\n  if (scale != null) {\n    scaleShape = scale.shape;\n    finalInputs.push(scale);\n  }\n  const program = env().getBool('WEBGL_PACK_NORMALIZATION') ?\n    new BatchNormPackedProgram(\n      x.shape, mean.shape, variance.shape, offsetShape, scaleShape,\n      varianceEpsilon) : new BatchNormProgram(\n      x.shape, mean.shape, variance.shape, offsetShape, scaleShape,\n      varianceEpsilon);\n  const output = backend.runWebGLProgram(program, finalInputs, finalInputs[0].dtype);\n  return output;\n};\n\nexport const batchNormConfig: KernelConfig = {\n  kernelName: FusedBatchNorm,\n  backendName: 'webgl',\n  kernelFunc: batchNorm as {\n    } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class SliceProgram implements GPGPUProgram {\n  variableNames = ['source'];\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n  // Caching uniform location for speed.\n  startLoc: WebGLUniformLocation;\n  constructor(destSize: number[]) {\n    this.outputShape = destSize;\n    this.rank = destSize.length;\n    const dtype = getCoordsDataType(this.rank);\n    const uniformPart = `uniform int start[${this.rank}];`;\n    const sourceCoords = getCoords(this.rank);\n    let body: string;\n    const coordSum = destSize.map((_, i) => {\n      return `sourceLoc.${sourceCoords[i]} = start[${i]} + coords.${sourceCoords[i]};`;\n    });\n    body = `\n      ${dtype} sourceLoc;\n      ${dtype} coords =\n      getOutputCoords();\n      ${coordSum.join('\\n')}\n      `;\n    this.userCode = `\n      ${uniformPart}\n      void main() {\n        ${body}\n        setOutput(getSource(${sourceCoords}));\n      }\n      `;\n  }\n  getCustomSetupFunc(start: number[]) {\n    if (start.length !== this.rank) {\n      throw Error(`The rank (${this.rank}) of the program must match the ` +\n        `length of start (${start.length})`);\n    }\n    return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n      if (this.startLoc == null) {\n        this.startLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'start');\n        if (this.startLoc == null) {\n          // This means
```

```

the compiler has optimized and realized it doesn't need\n      // the uniform.\n      return;\n    }\n  }\n  gpgpu.gl.uniform1iv(this.startLoc, start);\n  }\n}\n\nconst coords = ['x', 'y', 'z', 'w', 'u', 'v'];\n\nfunction\ngetCoords(rank: number): string {\n  if (rank === 1) {\n    return 'sourceLoc';\n  } else if (rank <= 6) {\n    return\ncoords.slice(0, rank).map(x => 'sourceLoc.' + x).join(',');\n  } else {\n    throw Error(`Slicing for rank ${rank} is not\nyet supported`);\n  }\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

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=====\n
*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport\n{getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class\nSlicePackedProgram implements GPGPUProgram {\n  variableNames = ['source'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n\n  // Caching uniform\n  location for speed.\n  startLoc: WebGLUniformLocation;\n\n  constructor(destSize: number[]) {\n    this.outputShape = destSize;\n    this.rank = destSize.length;\n\n    const dtype = getCoordsDataType(this.rank);\n    const coords = getChannels('coords', this.rank);\n    const sourceLoc = getChannels('sourceLoc', this.rank);\n\n    const innerDims =\n      this.rank === 1 ? 'sourceLoc' : `vec2(${sourceLoc.slice(-2).join()})`;\n    const getChannel\n    =\n      `getChannel(getSource(${sourceLoc.join()}), ${innerDims})`;\n    const upperRow = `\n      result.x =\n      ${getChannel};\n      if (++${coords[this.rank - 1]} < ${destSize[this.rank - 1]}) {\n        ++${sourceLoc[this.rank -\n1]};\n        result.y = ${getChannel};\n        --${sourceLoc[this.rank - 1]};\n      }\n      `;\n    const lowerRow =\n      this.rank === 1 ? `` : `\n      --${coords[this.rank - 1]};\n      if (++${coords[this.rank - 2]} < ${destSize[this.rank -\n2]}) {\n        ++${sourceLoc[this.rank - 2]};\n        result.z = ${getChannel};\n        if (++${coords[this.rank - 1]} <\n${destSize[this.rank - 1]}) {\n          ++${sourceLoc[this.rank - 1]};\n          result.w = ${getChannel};\n        }\n      }\n      `;\n\n    const sourceLocSetup = this.rank <= 4 ?\n      `sourceLoc = coords +\n      ${dtype}(${destSize.map((_, i) => `start[${i}]`).join()})` :\n      `destSize.map((_, i) => `${sourceLoc[i]} =\n      ${coords[i]} + start[${i}];`)\n      .join("\\n");\n    this.userCode = `\n      uniform int start[${this.rank}];\n      void\n      main() {\n        ${dtype} coords = getOutputCoords();\n        ${dtype} sourceLoc;\n        ${sourceLocSetup}\n        vec4 result = vec4(0.);\n        ${upperRow}\n        ${lowerRow}\n        setOutput(result);\n      }\n      `;\n  }\n\n  getCustomSetupFunc(start: number[]) {\n    if (start.length !== this.rank) {\n      throw Error(`The rank\n      (${this.rank}) of the program must match the\n      ` +\n      `length of start (${start.length})`);\n    }\n    return (gpgpu:\n      GPGPUContext, webGLProgram: WebGLProgram) => {\n      if (this.startLoc == null) {\n        this.startLoc =\n        gpgpu.getUniformLocationNoThrow(webGLProgram, 'start');\n        if (this.startLoc == null) {\n          // This means\n          the compiler has optimized and realized it doesn't need\n          // the uniform.\n          return;\n        }\n      }\n      gpgpu.gl.uniform1iv(this.startLoc, start);\n    }\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,\nKernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from\n'./backend_webgl';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from\n'./Transpose';\n\nexport const batchToSpaceND = (args: {\n  inputs: BatchToSpaceNDInputs,\n  backend:

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MathBackendWebGL,\n attrs: BatchToSpaceNDAttrs\n): TensorInfo => {\n  const { inputs, backend, attrs } =
args;\n  const { x } = inputs;\n  const { blockShape, crops } = attrs;\n  \n  util.assert(\n    x.shape.length <= 4,\n    ()
=> 'batchToSpaceND for rank > 4 with a WebGL backend not ' +\n      'implemented yet');\n  const prod =
blockShape.reduce((a, b) => a * b);\n  \n  const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted =\n  backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords =\n  backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize =\n  backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n  \n  const toDispose = [];\n  \n  const
reshapedIntermediate =\n    reshape({ inputs: { x }, backend, attrs: { shape: reshaped } });\n  const
transposedIntermediate = transpose(\n    { inputs: { x: reshapedIntermediate }, backend, attrs: { perm: permuted } });\n  const
reshapedIntermediate2 = reshape({\n    inputs: { x: transposedIntermediate },\n    backend,\n    attrs: { shape:
reshapedPermuted }\n  });\n  const sliced = slice({\n    inputs: { x: reshapedIntermediate2 },\n    backend,\n    attrs:
{ begin: sliceBeginCoords, size: sliceSize }\n  });\n  \n  toDispose.push(reshapedIntermediate);\n  toDispose.push(transposedIntermediate);\n  toDispose.push(reshapedIntermediate2);\n  \n  toDispose.forEach(t =>
backend.disposeIntermediateTensorInfo(t));\n  \n  return sliced;\n};\n\nexport const batchToSpaceNDConfig:
KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'webgl',\n  kernelFunc: batchToSpaceND as
{ } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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"AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport { Bincount, BincountAttrs, BincountInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray } from
'@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { bincountImplCPU }
from '../kernel_utils/shared';\n\nexport function bincount(args: {\n  inputs: BincountInputs,\n  backend:
MathBackendWebGL,\n  attrs: BincountAttrs\n}): TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { x,
weights } = inputs;\n  const { size } = attrs;\n  \n  const xVals = backend.readSync(x.dataId) as TypedArray;\n  const
weightsVals = backend.readSync(weights.dataId) as TypedArray;\n  \n  const outVals =\n  bincountImplCPU(xVals, weightsVals, weights.dtype, weights.shape, size);\n  \n  return
backend.makeTensorInfo([size], weights.dtype, outVals);\n}\n\nexport const bincountConfig: KernelConfig = {\n
kernelName: Bincount,\n  backendName: 'webgl',\n  kernelFunc: bincount as { } as KernelFunc\n};\n\n"/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from
'../backend_webgl';\nimport { UnaryOpProgram } from '../unary_op_gpu';\n\nconst TO_INT = `return
float(int(x));`\n\nexport function int(input: TensorInfo, backend: MathBackendWebGL): TensorInfo {\n  const
program = new UnaryOpProgram(input.shape, TO_INT);\n  const output = backend.runWebGLProgram(program,
[input], 'int32');\n  return { dataId: output.dataId, shape: output.shape, dtype: output.dtype };\n}\n\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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```
=====\n*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ClipProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  userCode: string;\n  outputShape: number[];\n\n  // Caching uniform locations for speed.\n  minLoc: WebGLUniformLocation;\n  maxLoc: WebGLUniformLocation;\n\n  constructor(aShape: number[]) {\n    this.outputShape = aShape;\n    this.userCode =`\n      uniform float minVal;\n      uniform float maxVal;\n\n      void main() {\n        float value =\n        getAAtOutCoords();\n        if (isnan(value)) {\n          setOutput(value);\n          return;\n        }\n        setOutput(clamp(value, minVal, maxVal));\n      }\n    `;\n\n    getCustomSetupFunc(min: number, max: number) {\n      return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n        if (this.minLoc == null) {\n          this.minLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'minVal');\n          this.maxLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'maxVal');\n        }\n        gpgpu.gl.uniform1f(this.minLoc, min);\n        gpgpu.gl.uniform1f(this.maxLoc, max);\n      }; \n    }\n  }\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ClipPackedProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  packedInputs = true;\n  packedOutput = true;\n  userCode: string;\n  outputShape: number[];\n\n  // Caching uniform locations for speed.\n  minLoc: WebGLUniformLocation;\n  maxLoc: WebGLUniformLocation;\n\n  constructor(aShape: number[]) {\n    this.outputShape = aShape;\n    this.userCode =`\n      uniform float minVal;\n      uniform float maxVal;\n\n      void main() {\n        vec4 value = getAAtOutCoords();\n\n        if (any(isnan(value))) {\n          setOutput(value);\n          return;\n        }\n        setOutput(clamp(value, vec4(minVal), vec4(maxVal)));\n      }\n    `;\n\n    getCustomSetupFunc(min: number, max: number) {\n      return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n        if (this.minLoc == null) {\n          this.minLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'minVal');\n          this.maxLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'maxVal');\n        }\n        gpgpu.gl.uniform1f(this.minLoc, min);\n        gpgpu.gl.uniform1f(this.maxLoc, max);\n      }; \n    }\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {ClipProgram} from './clip_gpu';\nimport {ClipPackedProgram} from './clip_packed_gpu';\n\nexport function clipByValue(args: {\n  inputs: ClipByValueInputs,\n  backend: MathBackendWebGL,\n  attrs: ClipByValueAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {clipValueMin, clipValueMax} = attrs;\n  let program;\n  if (env().getBool('WEBGL_PACK_CLIP')) {\n    program = new ClipPackedProgram(x.shape);\n  } else {\n    program = new ClipProgram(x.shape);\n  }\n  const customSetup =
```



```

program.getCustomSetupFunc(clipValueMin, clipValueMax);\n return backend.runWebGLProgram(program, [x],
x.dtype, customSetup);\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'webgl',\n kernelFunc: clipByValue as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright
2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ComplexAbsProgram implements
GPGPUProgram {\n variableNames = ['real', 'imag'];\n userCode: string;\n outputShape: number[];\n\n constructor(shape: number[]) {\n this.outputShape = shape;\n this.userCode = `
void main() {\n float re
= abs(getRealAtOutCoords());\n float im = abs(getImagAtOutCoords());\n float mx = max(re, im);\n
// sadly the length function in glsl is not underflow-safe\n // (at least not on Intel GPUs). So the safe solution
is\n // to ensure underflow-safety in all cases.\n setOutput(\n mx == 0.0 ? 0.0 : mx * length(vec2(1,
min(re, im)/mx))\n );\n }\n `;\n }\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {ComplexAbs, ComplexAbsInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ComplexAbsProgram} from
'./complex_abs_gpu';\n\n// Returns a TensorInfo with the complex shape and the dataId of the\n// underlying part.
We need to do this because a reshaped complex tensor is\n// not reflected in its parts.\nfunction
makeComplexComponentTensorInfo(\n complexTensor: TensorInfo, complexPart: TensorInfo): TensorInfo {\n
return {\n dataId: complexPart.dataId,\n dtype: complexPart.dtype,\n shape: complexTensor.shape\n
};\n}\n\nexport function complexAbs(\n args: {inputs: ComplexAbsInputs, backend: MathBackendWebGL}):
TensorInfo {\n const {inputs, backend} = args;\n const {x} = inputs;\n\n const xData =
backend.texData.get(x.dataId);\n\n const program = new ComplexAbsProgram(x.shape);\n const programInputs =
[\n makeComplexComponentTensorInfo(x, xData.complexTensorInfos.real),\n
makeComplexComponentTensorInfo(x, xData.complexTensorInfos.imag),\n ];\n\n return
backend.runWebGLProgram(\n program, programInputs, programInputs[0].dtype);\n}\n\nexport const
complexAbsConfig: KernelConfig = {\n kernelName: ComplexAbs,\n backendName: 'webgl',\n kernelFunc:
complexAbs as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n
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compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class ConcatProgram implements GPGPUProgram {\n variableNames: string[];\n
outputShape: number[] = [];\n userCode: string;\n\n // Concat 2d tensors along axis=1. See comments in

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MathBackendWebGL.concat().\n constructor(shapes: Array<[number, number]>) {\n  this.outputShape =
backend_util.computeOutShape(shapes, 1 /* axis */);\n  this.variableNames = shapes.map((_, i) => `T${i}`);\n\n  const offsets: number[] = new Array(shapes.length - 1);\n  offsets[0] = shapes[0][1];\n  for (let i = 1; i <
offsets.length; i++) {\n    offsets[i] = offsets[i - 1] + shapes[i][1];\n  }\n\n  const snippets = [\n    `if (yC <
${offsets[0]}) setOutput(getT0(yR, yC));`\n    for (let i = 1; i < offsets.length; i++) {\n      const shift = offsets[i -
1];\n      snippets.push(\n        `else if (yC < ${offsets[i]})` +\n        `setOutput(getT${i}(yR, yC-${shift}));`\n      );\n    }\n    const lastIndex = offsets.length;\n    const lastShift = offsets[offsets.length - 1];\n    snippets.push(`else
setOutput(getT${lastIndex}(yR, yC-${lastShift}));`);\n\n    this.userCode = \n      void main() {\n        ivec2 coords
= getOutputCoords();\n        int yR = coords.x;\n        int yC = coords.y;\n        ${snippets.join("\n ")}\n      }\n    `;\n  }\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class ConcatPackedProgram implements GPGPUProgram {\n  variableNames:
string[];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[] = [];\n  userCode: string;\n\n  constructor(shapes: number[][], axis: number) {\n    this.outputShape = backend_util.computeOutShape(shapes,
axis);\n    const shape = this.outputShape;\n    const rank = shape.length;\n    const dtype =
getCoordsDataType(rank);\n    const coords = getChannels('coords', rank);\n    const channels = ['x', 'y', 'z', 'w', 'u',
'v'].slice(0, rank);\n    this.variableNames = shapes.map((_, i) => `T${i}`);\n\n    const offsets: number[] = new
Array(shapes.length - 1);\n    offsets[0] = shapes[0][axis];\n    for (let i = 1; i < offsets.length; i++) {\n      offsets[i] =
offsets[i - 1] + shapes[i][axis];\n    }\n\n    const channel = channels[axis];\n    const lastChannels = channels.slice(-
2);\n    const allChannels = channels.join();\n\n    let getValueSnippet = `if (${channel} < ${offsets[0]}) {\n
return getChannel(\n      getT0(${allChannels}), vec2(${lastChannels.join()});\n    );`\n    for (let i = 1; i <
offsets.length; i++) {\n      const shift = offsets[i - 1];\n      // Note: the >= comparison below may seem unnecessary
given the check\n      // above but is needed to workaround branch execution issues on some\n      // devices. It makes
all the conditions exclusive without relying on\n      // execution order.\n      getValueSnippet += \n      if
(${channel} < ${offsets[i]} && ${channel} >= ${offsets[i - 1]}) {\n        return getChannel(\n
getT${i}(${shiftedChannels(channels, channel, shift)}),\n          vec2(${shiftedChannels(lastChannels, channel,
shift)});\n        );\n      }\n    }\n    const lastIndex = offsets.length;\n    const shift = offsets[offsets.length - 1];\n
getValueSnippet += \n    return getChannel(\n      getT${lastIndex}(${shiftedChannels(channels, channel,
shift)}),\n      vec2(${shiftedChannels(lastChannels, channel, shift)});\n    );\n\n    this.userCode = \n      float
getValue(${channels.map(x => 'int ' + x)}) {\n        ${getValueSnippet}\n      }\n\n      void main() {\n        ${dtype}
coords = getOutputCoords();\n        vec4 result = vec4(getValue(${coords}), 0., 0., 0.); \n        ${coords[rank - 1]}
= ${coords[rank - 1]} + 1;\n        if (${coords[rank - 1]} < ${shape[rank - 1]}) {\n          result.g =
getValue(${coords});\n        }\n        ${coords[rank - 2]} = ${coords[rank - 2]} + 1;\n        if (${coords[rank - 2]}
< ${shape[rank - 2]}) {\n          result.a = getValue(${coords});\n        }\n        ${coords[rank - 1]} =
${coords[rank - 1]} - 1;\n        if (${coords[rank - 2]} < ${shape[rank - 2]} &&\n          ${coords[rank - 1]} <
${shape[rank - 1]}) {\n          result.b = getValue(${coords});\n        }\n        setOutput(result);\n      }\n    `;\n  }\n}\n\n/**\n * Return an expression for coordinates into a vector where a given channel\n * will be offset by
[shift].\n * @param channels the channels to consider\n * @param channel the channel we want shifted\n * @param shift the amount to subtract from the channel.\n * @returns a string of the form 'x, y-[shift], z' where
any one channel can\n * have the shift applied.\n */\nfunction shiftedChannels(channels: string[], channel: string,

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shift: number) {\n  const channelId = channels.indexOf(channel);\n  const res = channels.map((c, idx) => {\n    if\n    (idx === channelId) {\n      return `${c} - ${shift}`;\n    } else {\n      return c;\n    }\n  });\n  return\n  res.join();\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
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=====\n*\n\nimport {Imag, ImagInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport\n{MathBackendWebGL} from '../backend_webgl';\nimport {identity} from './Identity';\n\nexport function imag(args:\n {inputs: ImagInputs, backend: MathBackendWebGL});\n  TensorInfo {\n    const {inputs, backend} = args;\n    const\n    {input} = inputs;\n    const inputData = backend.texData.get(input.dataId);\n\n    return identity({inputs: {x:\n    inputData.complexTensorInfos.imag}, backend});\n  }\n\nexport const imagConfig: KernelConfig = {\n  kernelName: Imag,\n  backendName: 'webgl',\n  kernelFunc: imag as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {concatImpl} from\n './Concat_impl';\nimport {identity} from './Identity';\n\nexport function concat(\n  args:\n  {inputs:\n  ConcatInputs, attrs: ConcatAttrs, backend: MathBackendWebGL});\n  TensorInfo {\n    const {inputs, backend,\n    attrs} = args;\n    const {axis} = attrs;\n\n    const $axis = util.parseAxisParam(axis, inputs[0].shape)[0];\n    const\n    outShape =\n    backend_util.computeOutShape(inputs.map(t => t.shape), $axis);\n\n    if\n    (util.sizeFromShape(outShape) === 0) {\n      return backend.makeTensorInfo(outShape, inputs[0].dtype, []);\n    }\n\n    // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n    const $inputs = inputs.filter(t =>\n    util.sizeFromShape(t.shape) > 0);\n    if ($inputs.length === 1) {\n      return identity({inputs: {x: $inputs[0]},\n      backend});\n    }\n\n    const shapes = $inputs.map(t => t.shape);\n    backend_util.assertParamsConsistent(shapes,\n    $axis);\n\n    return concatImpl($inputs, $axis, backend);\n  }\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'webgl',\n  kernelFunc: concat as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from\n './gpgpu_math';\n\nexport class Conv2DProgram implements GPGPUProgram {\n  variableNames = ['x', 'W'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    convInfo: backend_util.Conv2DInfo, addBias =\n    false,\n    activation: string = null, hasPreluActivationWeights = false,\n    hasLeakyreluAlpha = false) {\n    this.outputShape = convInfo.outShape;\n    const padTop = convInfo.padInfo.top;\n    const padLeft =\n    convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
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convInfo.strideWidth;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth =
convInfo.filterWidth;\n\n  const inputDepthNearestVec4 = Math.floor(convInfo.inChannels / 4) * 4;\n  const
inputDepthVec4Remainder = convInfo.inChannels % 4;\n  const isChannelsLast = convInfo.dataFormat ===
'channelsLast';\n\n  const rowDim = isChannelsLast ? 1 : 2;\n  const colDim = isChannelsLast ? 2 : 3;\n  const
channelDim = isChannelsLast ? 3 : 1;\n\n  let activationSnippet = ", applyActivationSnippet = ";\n  if (activation)
{\n    if (hasPreluActivationWeights) {\n      activationSnippet = `float activation(float a) {\n        float b =
getPreluActivationWeightsAtOutCoords();\n          ${activation}\n        }`; \n    } else if (hasLeakyreluAlpha) {\n
activationSnippet = `float activation(float a) {\n        float b = getLeakyreluAlphaAtOutCoords();\n
${activation}\n        }`; \n    } else {\n      activationSnippet = `\n        float activation(float x) {\n
${activation}\n        }\n        `;\n    }\n\n    applyActivationSnippet = `result = activation(result);`; \n  }\n\n
const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : ";\n  if (addBias) {\n
this.variableNames.push('bias');\n  }\n\n  if (hasPreluActivationWeights) {\n
this.variableNames.push('preluActivationWeights');\n  }\n\n  if (hasLeakyreluAlpha) {\n
this.variableNames.push('leakyreluAlpha');\n  }\n\n  this.userCode = `\n    ${activationSnippet}\n\n    const
ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n    const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n
void main() {\n      ivec4 coords = getOutputCoords();\n      int batch = coords[0];\n      int d2 =
coords[${channelDim}];\n\n      ivec2 xRCCorner =\n        ivec2(coords[${rowDim}], coords[${colDim}]) *
strides - pads;\n      int xRCorner = xRCCorner.x;\n      int xCCorner = xRCCorner.y;\n\n      // Convolve x(?, ?,
d1) with w(:, :, d1, d2) to get y(yR, yC, d2).\n      // ? = to be determined. := across all values in that axis.\n
float dotProd = 0.0;\n      for (int wR = 0; wR < ${filterHeight}; wR++) {\n        int xR = xRCorner + wR *
${dilationHeight};\n\n        if (xR < 0 || xR >= ${convInfo.inHeight}) {\n          continue;\n        }\n\n        for
(int wC = 0; wC < ${filterWidth}; wC++) {\n          int xC = xCCorner + wC * ${dilationWidth};\n\n          if (xC
< 0 || xC >= ${convInfo.inWidth}) {\n            continue;\n          }\n\n          for (int d1 = 0; d1 <
${inputDepthNearestVec4}; d1 += 4) {\n            vec4 wValues = vec4(\n              getW(wR, wC, d1, d2),\n
getW(wR, wC, d1 + 1, d2),\n              getW(wR, wC, d1 + 2, d2),\n              getW(wR, wC, d1 + 3, d2)\n
);\n\n            if (${isChannelsLast}) {\n              vec4 xValues = vec4(\n                getX(batch, xR, xC, d1),\n
getX(batch, xR, xC, d1 + 1),\n                getX(batch, xR, xC, d1 + 2),\n                getX(batch, xR, xC, d1 +
3)\n              );\n              dotProd += dot(xValues, wValues);\n            } else {\n              vec4 xValues =
vec4(\n                getX(batch, d1, xR, xC),\n                getX(batch, d1 + 1, xR, xC),\n                getX(batch, d1 +
2, xR, xC),\n                getX(batch, d1 + 3, xR, xC)\n              );\n              dotProd += dot(xValues, wValues);\n
            }\n\n            if (${inputDepthVec4Remainder === 1}) {\n              if (${isChannelsLast}) {\n
dotProd +=\n                getX(batch, xR, xC, ${inputDepthNearestVec4}) * \n                getW(wR, wC,
${inputDepthNearestVec4}, d2);\n              } else {\n                dotProd +=\n                getX(batch,
${inputDepthNearestVec4}, xR, xC) * \n                getW(wR, wC, ${inputDepthNearestVec4}, d2);\n              }\n
            } else if (${inputDepthVec4Remainder === 2}) {\n              vec2 wValues = vec2(\n
getW(wR, wC, ${inputDepthNearestVec4}, d2),\n              getW(wR, wC, ${inputDepthNearestVec4} + 1, d2)\n
);\n\n              if (${isChannelsLast}) {\n                vec2 xValues = vec2(\n                  getX(batch, xR, xC,
${inputDepthNearestVec4}),\n                  getX(batch, xR, xC, ${inputDepthNearestVec4} + 1)\n                );\n
dotProd += dot(xValues, wValues);\n              } else {\n                vec2 xValues = vec2(\n                  getX(batch,
${inputDepthNearestVec4}, xR, xC),\n                  getX(batch, ${inputDepthNearestVec4} + 1, xR, xC)\n                );\n
dotProd += dot(xValues, wValues);\n              }\n\n              } else if (${inputDepthVec4Remainder ===
3}) {\n                vec3 wValues = vec3(\n                  getW(wR, wC, ${inputDepthNearestVec4}, d2),\n
getW(wR, wC, ${inputDepthNearestVec4} + 1, d2),\n                  getW(wR, wC, ${inputDepthNearestVec4} + 2,
d2)\n                );\n\n                if (${isChannelsLast}) {\n                  vec3 xValues = vec3(\n
getX(batch, xR, xC, ${inputDepthNearestVec4}),\n                  getX(batch, xR, xC, ${inputDepthNearestVec4} + 1),\n
getX(batch, xR, xC, ${inputDepthNearestVec4} + 2)\n                );\n                dotProd += dot(xValues, wValues);\n
              } else {\n                vec3 xValues = vec3(\n                  getX(batch, ${inputDepthNearestVec4}, xR, xC),\n
getX(batch, ${inputDepthNearestVec4} + 1, xR, xC),\n                  getX(batch, ${inputDepthNearestVec4} + 2, xR, xC)\n
                );\n                dotProd += dot(xValues, wValues);\n              }\n            }\n          }\n
        }\n      }\n\n      result = dotProd;\n    }\n  `;\n  }\n\n  return this.userCode;\n}

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    getX(batch, ${inputDepthNearestVec4} + 1, xR, xC),\n                getX(batch, ${inputDepthNearestVec4} +
2, xR, xC)\n        );\n        dotProd += dot(xValues, wValues);\n        }\n        }\n        }\n        }\n        float result = dotProd;\n        ${addBiasSnippet}\n        ${applyActivationSnippet}\n        setOutput(result);\n    }\n    `;\n    }\n}\n\nexport class Conv3DProgram implements GPGPUProgram {\n
variableNames = ['x', 'W'];\n    outputShape: number[];\n    userCode: string;\n\n    constructor(convInfo:
backend_util.Conv3DInfo) {\n        this.outputShape = convInfo.outShape;\n        const padFront =
convInfo.padInfo.front;\n        const padTop = convInfo.padInfo.top;\n        const padLeft = convInfo.padInfo.left;\n
const strideDepth = convInfo.strideDepth;\n        const strideHeight = convInfo.strideHeight;\n        const strideWidth =
convInfo.strideWidth;\n        const dilationDepth = convInfo.dilationDepth;\n        const dilationHeight =
convInfo.dilationHeight;\n        const dilationWidth = convInfo.dilationWidth;\n        const filterDepth =
convInfo.filterDepth;\n        const filterHeight = convInfo.filterHeight;\n        const filterWidth =
convInfo.filterWidth;\n\n        const inputDepthNearestVec4 = Math.floor(convInfo.inChannels / 4);
const
inputDepthVec4Remainder = convInfo.inChannels % 4;\n        this.userCode = `\n        const ivec3 strides =
ivec3(${strideDepth}, ${strideHeight}, ${\n        strideWidth});\n        const ivec3 pads = ivec3(${padFront},
${padTop}, ${padLeft});\n\n        void main() {\n            ivec5 coords = getOutputCoords();\n            int batch =
coords.x;\n            int d2 = coords.u;\n\n            ivec3 xFRCCorner = ivec3(coords.y, coords.z, coords.w) * strides -
pads;\n            int xFCorner = xFRCCorner.x;\n            int xRCorner = xFRCCorner.y;\n            int xCCorner =
xFRCCorner.z;\n            // Convolve x(?, ?, ?, d1) with w(:, :, :, d1, d2) to get\n            // y(yF, yR, yC, d2). ? = to be
determined. : = across all\n            // values in that axis.\n            float dotProd = 0.0;\n            for (int wF = 0; wF <
${filterDepth}; wF++) {\n                int xF = xFCorner + wF * ${dilationDepth};\n                if (xF < 0 || xF >=
${convInfo.inDepth}) {\n                    continue;\n                }\n\n                for (int wR = 0; wR < ${filterHeight}; wR++) {\n
int xR = xRCorner + wR * ${dilationHeight};\n                    if (xR < 0 || xR >= ${convInfo.inHeight}) {\n
continue;\n                }\n\n                for (int wC = 0; wC < ${filterWidth}; wC++) {\n                    int xC = xCCorner + wC *
${dilationWidth};\n                    if (xC < 0 || xC >= ${convInfo.inWidth}) {\n                        continue;\n                    }\n\n                    for (int d1 = 0; d1 < ${inputDepthNearestVec4}; d1 += 4) {\n                        vec4 xValues = vec4(\n
getX(batch, xF, xR, xC, d1),\n                            getX(batch, xF, xR, xC, d1 + 1),\n                            getX(batch, xF, xR, xC, d1 +
2),\n                            getX(batch, xF, xR, xC, d1 + 3)\n                        );\n                        vec4 wValues = vec4(\n
getW(wF, wR, wC, d1, d2),\n                            getW(wF, wR, wC, d1 + 1, d2),\n                            getW(wF, wR, wC, d1 + 2,
d2),\n                            getW(wF, wR, wC, d1 + 3, d2)\n                        );\n                        dotProd += dot(xValues, wValues);\n                    }\n\n                    if (${inputDepthVec4Remainder} === 1) {\n                        dotProd +=\n                            getX(batch, xF,
xR, xC, ${inputDepthNearestVec4}) *\n                            getW(wF, wR, wC, ${inputDepthNearestVec4}, d2);\n                    }\n                    else if (${inputDepthVec4Remainder} === 2) {\n                        vec2 xValues = vec2(\n                            getX(batch, xF, xR, xC, ${inputDepthNearestVec4} + 1)\n
);;\n                        vec2 wValues = vec2(\n                            getW(wF, wR, wC, ${inputDepthNearestVec4}, d2),\n                            getW(wF, wR, wC, ${inputDepthNearestVec4} + 1, d2)\n
);;\n                        dotProd += dot(xValues, wValues);\n                    }\n                    else if (${inputDepthVec4Remainder} === 3) {\n                        vec3 xValues = vec3(\n
getX(batch, xF, xR, xC, ${inputDepthNearestVec4}),\n                            getX(batch, xF, xR, xC,
${inputDepthNearestVec4} + 1),\n                            getX(batch, xF, xR, xC, ${inputDepthNearestVec4} + 2)\n
);;\n                        vec3 wValues = vec3(\n                            getW(wF, wR, wC, ${inputDepthNearestVec4}, d2),\n                            getW(wF, wR, wC, ${inputDepthNearestVec4} + 1, d2),\n
getW(wF, wR, wC, ${inputDepthNearestVec4} + 2, d2)\n                        );;\n                        dotProd += dot(xValues, wValues);\n                    }\n                }\n            }\n            setOutput(dotProd);\n        }\n    }\n}\n\n`;\n}\n}\n}\n\n`/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {getGlsIDifferences} from
'./glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Im2ColPackedProgram
implements GPGPUProgram {\n  variableNames = ['A'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    outputShape: number[], inputShape: number[],\n    convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = outputShape;\n\n    const {\n      filterWidth,\n      inChannels,\n      strideWidth,\n      strideHeight,\n      padInfo,\n      outWidth,\n      dilationWidth,\n      dilationHeight,\n      dataFormat\n    } = convInfo;\n    const {left, top} = padInfo;\n    const itemsPerBlockRow =
inChannels * filterWidth;\n    const glsl = getGlsIDifferences();\n    const isChannelsLast = dataFormat ===
'channelsLast';\n    const rowDim = isChannelsLast ? 0 : 1;\n    const colDim = isChannelsLast ? 1 : 2;\n\n    let
unrolled = ``;\n\n    for (let row = 0; row <= 1; row++) {\n      for (let col = 0; col <= 1; col++) {\n        unrolled +=
`\n        blockIndex = rc.y + ${col};\n        pos = rc.x + ${row};\n        if(blockIndex < ${outputShape[1]} &&
pos < ${outputShape[0]}) {\n          offsetY = int(blockIndex / (${outWidth})) * ${strideHeight} - ${\n
top});\n          d0 = offsetY + ${dilationHeight} * (pos / ${itemsPerBlockRow});\n          if(d0 <
${inputShape[rowDim]} && d0 >= 0) {\n            offsetX = int(mod(float(blockIndex), ${outWidth}.) * ${\n
strideWidth}. - ${left}.);\n            d1 = offsetX + ${dilationWidth} * (int(mod(float(pos), ${\n
itemsPerBlockRow}.) / ${inChannels}.));\n            if(d1 < ${inputShape[colDim]} && d1 >= 0) {\n\n
ch = int(mod(float(pos), ${inChannels}.));\n            if (${isChannelsLast}) {\n              innerDims = vec2(d1,\n
ch);\n              result[${row} * 2 + col] = getChannel(\n                getA(d0, int(innerDims.x),\n
int(innerDims.y)), innerDims);\n            } else {\n              innerDims = vec2(d0, d1);\n              result[${row}
* 2 + col] = getChannel(\n                getA(ch, int(innerDims.x),\n                  int(innerDims.y)), innerDims);\n
            }\n          }\n        }\n      }\n    }\n\n    this.userCode = `\n    void main() {\n      ivec2
rc = getOutputCoords();\n      vec4 result = vec4(0);\n      int blockIndex, pos, offsetY, d0, offsetX, d1, ch;\n
      vec2 innerDims;\n      ${unrolled}\n      ${glsl.output} = result;\n    }\n  `;\n\n  }\n\n  this\n\n  Copyright 2020 Google LLC. All Rights Reserved.\n  * Licensed under the Apache License, Version 2.0 (the
'License');\n  * you may not use this file except in compliance with the License.\n  * You may obtain a copy of the
License at\n  * http://www.apache.org/licenses/LICENSE-2.0\n  * Unless required by applicable law or
agreed to in writing, software\n  * distributed under the License is distributed on an 'AS IS' BASIS,\n  *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License for
the specific language governing permissions and\n  * limitations under the License.\n  *
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*/\n\nimport {backend_util, env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL}
from './backend_webgl';\nimport {Im2ColPackedProgram} from './im2col_packed_gpu';\nimport
{mapActivationToShaderProgram} from './kernel_utils/kernel_funcs_utils';\nimport {MatMulPackedProgram}
from './mulmat_packed_gpu';\nimport * as webgl_util from './webgl_util';\nimport {batchMatMulImpl,\nMATMUL_SHARED_DIM_THRESHOLD} from './BatchMatMul_impl';\nimport {identity} from
'./Identity';\nimport {reshape} from './Reshape';\n\ntype Conv2DConfig = {\n  x: TensorInfo,\n  filter: TensorInfo,\n
convInfo: backend_util.Conv2DInfo,\n  backend: MathBackendWebGL,\n  bias?: TensorInfo,\n
preluActivationWeights?: TensorInfo,\n  leakyreluAlpha?: number,\n  activation?: backend_util.Activation\n};\n\n//
For 1x1 kernels that iterate through every point in the input, convolution\n// can be expressed as matrix
multiplication (without need for memory\n// remapping).\n\nexport function conv2dByMatMul({\n  x,\n  filter,\n
convInfo,\n  backend,\n  bias = null,\n  preluActivationWeights = null,\n  leakyreluAlpha = 0,\n  activation =
null\n}: Conv2DConfig) {\n  // Reshapes conv2D input to 2D tensors, uses matMul and then reshape the\n // result
from 2D to 4D.\n  const xShape = x.shape;\n  const xTexData = backend.texData.get(x.dataId);\n  const
sharedMatMulDim = convInfo.inChannels;\n  const outerShapeX = xShape[0] * xShape[1] * xShape[2];\n  const
outerShapeFilter = convInfo.outChannels;\n  const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n
const transposeA = false;\n  const transposeB = false;\n\n  let out: TensorInfo;\n  const intermediates: TensorInfo[] =
[];\n\n  // TODO: Once reduction ops are packed, batchMatMul will always be packed\n // and we can remove this
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condition.\n const batchMatMulWillBeUnpacked =\n    (outerShapeX === 1 || outerShapeFilter === 1) &&\n    sharedMatMulDim > MATMUL_SHARED_DIM_THRESHOLD;\n    const reshapeWillBeExpensive = xShape[2]\n    % 2 !== 0 && !xTexData.isPacked;\n\n    if (batchMatMulWillBeUnpacked ||\n    !env().getBool('WEBGL_LAZILY_UNPACK') ||\n    !env().getBool('WEBGL_PACK_BINARY_OPERATIONS'))\n    ||\n    !reshapeWillBeExpensive) {\n        const targetShape = isChannelsLast ? xShape[0] * xShape[1] * xShape[2] :\n        xShape[0] * xShape[2] * xShape[3];\n        const xReshaped = reshape({\n            inputs: {x},\n            backend,\n            attrs: {shape: [1, targetShape, convInfo.inChannels]}\n        });\n        const filterReshaped = reshape({\n            inputs: {x: filter},\n            backend,\n            attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n        });\n        const result = batchMatMulImpl({\n            a: xReshaped,\n            b: filterReshaped,\n            transposeA,\n            transposeB,\n            backend,\n            bias,\n            activation,\n            preluActivationWeights,\n            leakyreluAlpha\n        });\n        out =\n        reshape(\n            {inputs: {x: result}, backend, attrs: {shape: convInfo.outShape}});\n        intermediates.push(xReshaped);\n        intermediates.push(filterReshaped);\n        intermediates.push(result);\n    } else {\n        // Following optimization is specific to packed |x| with odd row count\n        // (For example, in channelLast mode,\n        'row count' refers to x.shape[2]):\n        // we avoid expensive packed 2x2 reshape by padding row count to next,\n        // even number. When x.shape[2] is odd, the result of packed batchMatMul is\n        // the same (has the same texture\n        layout and and values in the texture) as\n        // it is for even x.shape[2] + 1. We make the odd-rows tensor to look\n        like\n        // even-rows tensor before the operation and, after the batchMatMul,\n        // fix the even-rows result to have\n        odd number of rows.\n        const targetShape = isChannelsLast ?\n            xShape[0] * xShape[1] * (xShape[2] + 1) :\n            xShape[0] * xShape[2] * (xShape[3] + 1);\n        const xReshaped: TensorInfo = {\n            dataId: x.dataId,\n            shape:\n            [1, targetShape, convInfo.inChannels],\n            dtype: x.dtype\n        }; \n        // xTexData.shape gets referenced from\n        GPGPUBinary.inShapeInfos.\n        // Decrementing row count, after batchMatMul->...->compileProgram leads to\n        // invalid row count within the reference in GPGPUBinary.inShapeInfos.\n        // Alternative fix would be to provide a\n        copy to GPGPUBinary.inShapeInfos\n        // in compileProgram method, but that would affect compilation of all\n        // programs - instead, provide a copy here, with even row count, before\n        // calling batchMatMul->...-\n        >compileProgram and after that, the original\n        // xTexData.shape is restored.\n        const originalXTexDataShape =\n        xTexData.shape;\n        xTexData.shape = xTexData.shape.slice();\n        xTexData.shape[xTexData.shape.length -\n        2]++; \n        util.assert(\n            webgl_util.isReshapeFree(xTexData.shape, xReshaped.shape),\n            () => `packed\n        reshape ${xTexData.shape} to ${\n            xReshaped.shape} isn't free`);\n        const filterReshaped = reshape({\n            inputs: {x: filter},\n            backend,\n            attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n        });\n        intermediates.push(filterReshaped);\n        const pointwiseConv = batchMatMulImpl({\n            a: xReshaped,\n            b:\n            filterReshaped,\n            backend,\n            transposeA,\n            transposeB,\n            bias,\n            activation,\n            preluActivationWeights,\n            leakyreluAlpha\n        });\n        const pointwiseConvTexData =\n        backend.texData.get(pointwiseConv.dataId);\n        util.assert(\n            pointwiseConvTexData.isPacked,\n            () =>\n            'batchMatMul result is expected to be packed');\n        // Restore the input shape to original.\n        xTexData.shape =\n        originalXTexDataShape;\n        // Set the output shape - there is no need for expensive reshape as data\n        // layout is\n        already correct.\n        pointwiseConvTexData.shape = convInfo.outShape;\n        out = identity({inputs: {x:\n        pointwiseConv}, backend});\n        out.shape = convInfo.outShape;\n        intermediates.push(pointwiseConv);\n    }\n    for (const i of intermediates) {\n        backend.disposeIntermediateTensorInfo(i);\n    }\n    return out;\n}\n\n// Implements the im2row algorithm as outlined in "High Performance\n// Convolutional Neural Networks for\n// Document Processing" (Suvisoft, 2006)\nexport function conv2dWithIm2Row({\n    x,\n    filter,\n    convInfo,\n    backend,\n    bias = null,\n    preluActivationWeights = null,\n    leakyreluAlpha = 0,\n    activation = null\n}): Conv2DConfig {\n    // Rearranges conv2d input so each block to be convolved over forms the\n    // column of a new\n    matrix with shape [filterWidth * filterHeight * \n    // inChannels, outHeight * outWidth]. The filter is also rearranged\n    so each\n    // output channel forms a row of a new matrix with shape [outChannels, \n    // filterWidth * filterHeight * \n    inChannels]. The convolution is then\n    // computed by multiplying these matrices and reshaping the result.\n    const\n    {\n        filterWidth,\n        filterHeight,\n        inChannels,\n        outWidth,\n        outHeight,\n        dataFormat\n    } = convInfo;\n    const isChannelsLast = dataFormat === 'channelsLast';\n    const sharedDim = filterWidth * filterHeight * \n    inChannels;\n    const numCols = outHeight * outWidth;\n    const x2ColShape = [sharedDim, numCols];\n    const

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class Conv2DDerFilterProgram implements GPGPUProgram {\n  variableNames = ['x',
'dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.filterShape;\n\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const padTop = convInfo.padInfo.top;\n    const padLeft = convInfo.padInfo.left;\n\n    const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n\n    this.userCode = `\n    void main() {\n      ivec4 coords = getOutputCoords();\n      int wR = coords.x;\n      int wC = coords.y;\n      int d1 = coords.z;\n      int d2 = coords.w;\n      // Convolve x(?, ?, d1) with dy(:, :, d2) to get dw(wR, wC, d1, d2).\n      // ? = to be
determined. := across all values in that axis.\n      float dotProd = 0.0;\n      for (int b = 0; b <
${convInfo.batchSize}; b++) {\n        for (int yR = 0; yR < ${convInfo.outHeight}; yR++) {\n          int xR = wR
+ yR * ${strideHeight} - ${padTop};\n\n          if (xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue;\n
          }\n\n          for (int yC = 0; yC < ${convInfo.outWidth}; yC++) {\n            int xC = wC + yC *
${strideWidth} - ${padLeft};\n\n            if (xC < 0 || xC >= ${convInfo.inWidth}) {\n              continue;\n
            }\n\n            if (${isChannelsLast}) {\n              float dyValue = getDy(b, yR, yC, d2);\n              float xValue =
getX(b, xR, xC, d1);\n              dotProd += (xValue * dyValue);\n            } else {\n              float dyValue =
getDy(b, d2, yR, yC);\n              float xValue = getX(b, d1, xR, xC);\n              dotProd += (xValue * dyValue);\n
            }\n\n          }\n        }\n      }\n      setOutput(dotProd);\n    }\n  }\n}\n\nexport class
Conv2DDerInputProgram implements GPGPUProgram {\n  variableNames = ['dy', 'W'];\n  outputShape:
number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape =
convInfo.inShape;\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const isChannelsLast
= convInfo.dataFormat === 'channelsLast';\n\n    const padTop = filterHeight - 1 - convInfo.padInfo.top;\n    const
padLeft = filterWidth - 1 - convInfo.padInfo.left;\n\n    const rowDim = isChannelsLast ? 1 : 2;\n    const colDim =
isChannelsLast ? 2 : 3;\n    const channelDim = isChannelsLast ? 3 : 1;\n\n    this.userCode = `\n    const ivec2 pads
= ivec2(${padTop}, ${padLeft});\n\n    void main() {\n      ivec4 coords = getOutputCoords();\n      int batch =
coords[0];\n      int d1 = coords[${channelDim}];\n      ivec2 dyCorner = ivec2(coords[${rowDim}],
coords[${colDim}]) - pads;\n      int dyRCorner = dyCorner.x;\n      int dyCCorner = dyCorner.y;\n      //
Convolve dy(?, ?, d2) with w(:, :, d1, d2) to compute dx(xR, xC, d1).\n      // ? = to be determined. := across all
values in that axis.\n      float dotProd = 0.0;\n      for (int wR = 0; wR < ${filterHeight}; wR++) {\n        float
dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n        if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||
fract(dyR) > 0.0) {\n          continue;\n        }\n\n        int idyR = int(dyR);\n\n        int wRPerm = ${filterHeight} -
1 - wR;\n\n        for (int wC = 0; wC < ${filterWidth}; wC++) {\n          float dyC = float(dyCCorner + wC) /
${strideWidth}.0;\n\n          if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 || fract(dyC) > 0.0) {\n            continue;\n
          }\n\n          int idyC = int(dyC);\n\n          int wCPerm = ${filterWidth} - 1 - wC;\n\n          for
(int d2 = 0; d2 < ${convInfo.outChannels}; d2++) {\n\n            if (${isChannelsLast}) {\n              float xValue =
getDy(batch, idyR, idyC, d2);\n              float wValue = getW(wRPerm, wCPerm, d1, d2);\n              dotProd +=
xValue * wValue;\n            } else {\n              float xValue = getDy(batch, d2, idyR, idyC);\n              float
wValue = getW(wRPerm, wCPerm, d1, d2);\n              dotProd += xValue * wValue;\n            }\n\n          }\n        }\n      }\n      setOutput(dotProd);\n    }\n  }\n}\n\nexport class Conv3DDerFilterProgram implements
GPGPUProgram {\n  variableNames = ['x', 'dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape = convInfo.filterShape;\n\n    const
strideDepth = convInfo.strideDepth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =

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convInfo.strideWidth;\n  const padFront = convInfo.padInfo.front;\n  const padTop = convInfo.padInfo.top;\n  const padLeft = convInfo.padInfo.left;\n\n  this.userCode = `
  void main() {\n    ivec5 coords =
  getOutputCoords();\n    int wF = coords.x;\n    int wR = coords.y;\n    int wC = coords.z;\n    int d1 =
  coords.w;\n    int d2 = coords.u;\n\n    float dotProd = 0.0;\n\n    for (int b = 0; b < ${convInfo.batchSize};
  b++) {\n      for (int yF = 0; yF < ${convInfo.outDepth}; yF++) {\n        int xF = wF + yF * ${strideDepth} -
  ${padFront};\n\n        if (xF < 0 || xF >= ${convInfo.inDepth}) {\n          continue;\n        }\n\n        for (int
  yR = 0; yR < ${convInfo.outHeight}; yR++) {\n          int xR = wR + yR * ${strideHeight} - ${padTop};\n\n          if (xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue;\n          }\n\n          for (int yC = 0; yC <
  ${convInfo.outWidth}; yC++) {\n            int xC = wC + yC * ${strideWidth} - ${padLeft};\n\n            if (xC <
  0 || xC >= ${convInfo.inWidth}) {\n              continue;\n            }\n\n            float dyValue = getDy(b, yF,
  yR, yC, d2);\n            float xValue = getX(b, xF, xR, xC, d1);\n            dotProd += (xValue * dyValue);\n          }\n        }\n      }\n    }\n    setOutput(dotProd);\n  }\n  `;\n}\n}\n\nexport class
Conv3DDerInputProgram implements GPGPUProgram {\n  variableNames = ['dy', 'W'];\n  outputShape:
number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape =
convInfo.inShape;\n\n    const filterDepth = convInfo.filterDepth;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const strideDepth = convInfo.strideDepth;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n\n    const padFront = filterDepth - 1 -
convInfo.padInfo.front;\n    const padTop = filterHeight - 1 - convInfo.padInfo.top;\n    const padLeft = filterWidth -
1 - convInfo.padInfo.left;\n\n    this.userCode = `
    const ivec3 pads = ivec3(${padFront}, ${padTop},
  ${padLeft});\n\n    void main() {\n      ivec5 coords = getOutputCoords();\n      int batch = coords.x;\n      int d1
  = coords.u;\n\n      ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w) - pads;\n      int dyFCorner =
  dyCorner.x;\n      int dyRCorner = dyCorner.y;\n      int dyCCorner = dyCorner.z;\n      float dotProd = 0.0;\n      for (int wF = 0; wF < ${filterDepth}; wF++) {\n        float dyF = float(dyFCorner + wF) / ${strideDepth}.0;\n\n        if (dyF < 0.0 || dyF >= ${convInfo.outDepth}.0 || fract(dyF) > 0.0) {\n          continue;\n        }\n\n        int idyF =
  int(dyF);\n\n        int wFPerm = ${filterDepth} - 1 - wF;\n\n        for (int wR = 0; wR < ${filterHeight}; wR++)
  {\n          float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n          if (dyR < 0.0 || dyR >=
  ${convInfo.outHeight}.0 ||\n            fract(dyR) > 0.0) {\n            continue;\n          }\n          int idyR =
  int(dyR);\n\n          int wRPerm = ${filterHeight} - 1 - wR;\n\n          for (int wC = 0; wC < ${filterWidth};
  wC++) {\n            float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n            if (dyC < 0.0 || dyC >=
  ${convInfo.outWidth}.0 ||\n              fract(dyC) > 0.0) {\n              continue;\n            }\n            int idyC =
  int(dyC);\n\n            int wCPerm = ${filterWidth} - 1 - wC;\n\n            for (int d2 = 0; d2 <
  ${convInfo.outChannels}; d2++) {\n              float xValue = getDy(batch, idyF, idyR, idyC, d2);\n              float
  wValue = getW(wFPerm, wRPerm, wCPerm, d1, d2);\n              dotProd += xValue * wValue;\n            }\n          }\n        }\n      }\n    }\n    setOutput(dotProd);\n  }\n  `;\n}\n}\n\n/*\n * @license\n * Copyright 2020 Google
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  use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
  http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
  governing permissions and\n * limitations under the License.\n *
  =====\n
  *\n  import {backend_util, Conv2DBackpropFilter, Conv2DBackpropFilterAttrs, Conv2DBackpropFilterInputs,
  KernelConfig, KernelFunc} from 'tensorflow/tfjs-core';\n  import {MathBackendWebGL} from
  './backend_webgl';\n  import {Conv2DDerFilterProgram} from './conv_backprop_gpu';\n\n  export function
  conv2DBackpropFilter(args: {\n    inputs: Conv2DBackpropFilterInputs,\n    attrs: Conv2DBackpropFilterAttrs,\n    backend: MathBackendWebGL\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x, dy} = inputs;\n    const
  {strides, pad, dataFormat, dimRoundingMode, filterShape} = attrs;\n\n    const $dataFormat =
  backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n

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x.shape as [number, number, number, number], filterShape, strides,\n    1 /* dilations */, pad, dimRoundingMode,
false /* depthwise */,\n    $dataFormat);\n\n const program = new Conv2DDerFilterProgram(convInfo);\n return
backend.runWebGLProgram(program, [x, dy], 'float32');\n\n\nexport const conv2DBackpropFilterConfig:
KernelConfig = {\n kernelName: Conv2DBackpropFilter,\n backendName: 'webgl',\n kernelFunc:
conv2DBackpropFilter as { } as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from
'./backend_webgl';\n\nimport { Conv2DDerInputProgram } from './conv_backprop_gpu';\n\nexport function
conv2DBackpropInput(args: {\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs,\n
backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {dy, filter} = inputs;\n const
{inputShape, strides, pad, dataFormat, dimRoundingMode} = attrs;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n    1 /* dilations */, pad,
dimRoundingMode, false, $dataFormat);\n\n const program = new Conv2DDerInputProgram(convInfo);\n return
backend.runWebGLProgram(program, [dy, filter], 'float32');\n\n\nexport const conv2DBackpropInputConfig:
KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'webgl',\n kernelFunc:
conv2DBackpropInput as { } as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { backend_util, Conv3D, Conv3DAttrs, Conv3DInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from './backend_webgl';\n\nimport { Conv3DProgram }
from './conv_gpu';\n\nexport function conv3D(\n args:\n    {inputs: Conv3DInputs, attrs: Conv3DAttrs,
backend: MathBackendWebGL}) {\n const {inputs, backend, attrs} = args;\n const {x, filter} = inputs;\n const
{strides, pad, dilations} = attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n    x.shape as [number,
number, number, number, number],\n    filter.shape as [number, number, number, number], strides,\n
dilations, pad);\n\n const program = new Conv3DProgram(convInfo);\n return
backend.runWebGLProgram(program, [x, filter], 'float32');\n\n\nexport const conv3DConfig: KernelConfig = {\n
kernelName: Conv3D,\n backendName: 'webgl',\n kernelFunc: conv3D as { } as KernelFunc,\n};\n", "/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { backend_util, Conv3DBackpropFilterV2, Conv3DBackpropFilterV2Attrs,

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Conv3DBackpropFilterV2Inputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {Conv3DDerFilterProgram} from
'./conv_backprop_gpu';\n\nexport function conv3DBackpropFilterV2(args: {\n inputs:
Conv3DBackpropFilterV2Inputs,\n attrs: Conv3DBackpropFilterV2Attrs,\n backend: MathBackendWebGL\n})
{\n const {inputs, backend, attrs} = args;\n const {x, dy} = inputs;\n const {strides, pad, filterShape} = attrs;\n\n
const convInfo = backend_util.computeConv3DInfo(\n  x.shape as [number, number, number, number, number],
filterShape, strides,\n  1 /* dilations */, pad);\n\n const program = new Conv3DDerFilterProgram(convInfo);\n
return backend.runWebGLProgram(program, [x, dy], 'float32');\n}\n\nexport const
conv3DBackpropFilterV2Config: KernelConfig = {\n kernelName: Conv3DBackpropFilterV2,\n backendName:
'webgl',\n kernelFunc: conv3DBackpropFilterV2 as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, Conv3DBackpropInputV2, Conv3DBackpropInputV2Attrs,
Conv3DBackpropInputV2Inputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {Conv3DDerInputProgram} from
'./conv_backprop_gpu';\n\nexport function conv3DBackpropInput(args: {\n inputs:
Conv3DBackpropInputV2Inputs,\n attrs: Conv3DBackpropInputV2Attrs,\n backend: MathBackendWebGL\n})
{\n const {inputs, backend, attrs} = args;\n const {dy, filter} = inputs;\n const {pad, strides, inputShape} =
attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n  inputShape, filter.shape as [number, number,
number, number, number],\n  strides, 1 /* dilations */, pad);\n\n const program = new
Conv3DDerInputProgram(convInfo);\n return backend.runWebGLProgram(program, [dy, filter],
'float32');\n}\n\nexport const conv3DBackpropInputConfig: KernelConfig = {\n kernelName:
Conv3DBackpropInputV2,\n backendName: 'webgl',\n kernelFunc: conv3DBackpropInput as { } as
KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {CHECK_NAN_SNIPPET_UNARY,
unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst COS = CHECK_NAN_SNIPPET_UNARY +
`\n return cos(x);\n`;\n\nexport const cos = unaryKernelFunc({opSnippet: COS});\n\nexport const cosConfig:
KernelConfig = {\n kernelName: Cos,\n backendName: 'webgl',\n kernelFunc: cos,\n};\n\n"/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from

```

```

./kernel_utils/kernel_funcs_utils';\n\nconst COSH = \n float e2x = exp(-x);\n return (e2x + 1.0 / e2x) /
2.0;\n';\n\nexport const cosh = unaryKernelFunc({opSnippet: COSH});\n\nexport const coshConfig: KernelConfig
= {\n kernelName: Cosh,\n backendName: 'webgl',\n kernelFunc: cosh,\n};\n","/**\n * @license\n * Copyright
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class CropAndResizeProgram implements
GPGPUProgram {\n variableNames = ['Image', 'Boxes', 'BoxInd'];\n outputShape: number[] = [];\n userCode:
string;\n constructor(\n imageShape: [number, number, number, number], boxShape: [number, number],\n
cropSize: [number, number], method: 'bilinear'|'nearest',\n extrapolationValue: number) {\n const [batch,
imageHeight, imageWidth, depth] = imageShape;\n const [numBoxes, ] = boxShape;\n const [cropHeight,
cropWidth] = cropSize;\n this.outputShape = [numBoxes, cropHeight, cropWidth, depth];\n const methodId =
method === 'bilinear' ? 1 : 0;\n\n const [inputHeightFloat, inputWidthFloat] =\n [`${imageHeight - 1}.0`,
`${imageWidth - 1}.0`];\n\n const [heightRatio, heightScale, inY] = cropHeight > 1 ?\n [\n
`${(imageHeight - 1) / (cropHeight - 1)}`, \n '(y2-y1) * height_ratio', \n `y1*${inputHeightFloat} +
float(y)*(height_scale)`, \n ] : \n ['0.0', \n '0.0', \n `0.5 * (y1+y2) * ${inputHeightFloat}`, \n
];\n\n const [widthRatio, widthScale, inX] = cropWidth > 1 ?\n [\n `${(imageWidth - 1) / (cropWidth -
1)}`, \n '(x2-x1) * width_ratio', \n `x1*${inputWidthFloat} + float(x)*(width_scale)`, \n ] : \n [\n
'0.0', \n '0.0', \n `0.5 * (x1+x2) * ${inputWidthFloat}`, \n ];\n\n // Reference implementation\n //
tslint:disable-next-line:max-line-length\n //

```

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https://github.com/tensorflow/tensorflow/blob/master/tensorflow/core/kernels/crop_and_resize_op_gpu.cu.cc\n
this.userCode = \n const float height_ratio = float(${heightRatio});\n const float width_ratio =
float(${widthRatio});\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int
y = coords[1];\n int x = coords[2];\n int d = coords[3];\n\n // get box vals\n float y1 =
getBoxes(b,0);\n float x1 = getBoxes(b,1);\n float y2 = getBoxes(b,2);\n float x2 = getBoxes(b,3);\n\n
// get image in batch index\n int bInd = round(getBoxInd(b));\n if(bInd < 0 || bInd >= ${batch}) {\n
return;\n }\n\n float height_scale = ${heightScale};\n float width_scale = ${widthScale};\n\n float
in_y = ${inY};\n if( in_y < 0.0 || in_y > ${inputHeightFloat} ) {\n
setOutput(float(${extrapolationValue}));\n return;\n }\n\n float in_x = ${inX};\n if( in_x < 0.0 ||
in_x > ${inputWidthFloat} ) {\n setOutput(float(${extrapolationValue}));\n return;\n }\n\n vec2
sourceFracIndexCR = vec2(in_x,in_y);\n if(${methodId} == 1) {\n // Compute the four integer indices.\n
ivec2 sourceFloorCR = ivec2(sourceFracIndexCR);\n ivec2 sourceCeilCR =
ivec2(ceil(sourceFracIndexCR));\n\n float topLeft = getImage(b, sourceFloorCR.y, sourceFloorCR.x, d);\n
float bottomLeft = getImage(b, sourceCeilCR.y, sourceFloorCR.x, d);\n float topRight = getImage(b,
sourceFloorCR.y, sourceCeilCR.x, d);\n float bottomRight = getImage(b, sourceCeilCR.y, sourceCeilCR.x,
d);\n\n vec2 fracCR = sourceFracIndexCR - vec2(sourceFloorCR);\n\n float top = topLeft + (topRight -
topLeft) * fracCR.x;\n float bottom = bottomLeft + (bottomRight - bottomLeft) * fracCR.x;\n float
newValue = top + (bottom - top) * fracCR.y;\n setOutput(newValue);\n } else {\n // Compute the
coordinators of nearest neighbor point.\n ivec2 sourceNearestCR = ivec2(floor(\n sourceFracIndexCR +
vec2(0.5,0.5))); \n float newValue = getImage(b, sourceNearestCR.y, sourceNearestCR.x, d);\n
setOutput(newValue);\n }\n }\n `;\n }\n}";\n"/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

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```
=====\n*\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {CropAndResizeProgram} from './crop_and_resize_gpu';\n\nexport const cropAndResize = (args: {n inputs: CropAndResizeInputs,\n backend: MathBackendWebGL,\n attrs: CropAndResizeAttrs\n}): TensorInfo => {\n  const {inputs, backend, attrs} = args;\n  const {image, boxes, boxInd} = inputs;\n  const {cropSize, method, extrapolationValue} = attrs;\n\n  const program = new CropAndResizeProgram(\n    image.shape as [number, number, number, number],\n    boxes.shape as [number, number], cropSize, method, extrapolationValue);\n  return backend.runWebGLProgram(program, [image, boxes, boxInd], 'float32');\n};\n\nexport const cropAndResizeConfig: KernelConfig = {\n  kernelName: CropAndResize,\n  backendName: 'webgl',\n  kernelFunc: cropAndResize as {} as KernelFunc\n};\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class CumSumProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n\n  // Caching uniform location for speed.\n  index: WebGLUniformLocation;\n\n  constructor(shape: number[], exclusive: boolean, reverse: boolean) {\n    this.outputShape = shape;\n    const rank = shape.length;\n    const val = exclusive ? '0.0' : `getX(${getCoords(rank, 'coords')})`;\n    const length = shape[shape.length - 1];\n    let condition = \";\n    let idxString = \";\n    // When exclusive is set, the cumsum op becomes roll op that copies the\n    // value from the previous index based on the direction specified by the\n    // reverse flag.\n    if (exclusive) {\n      condition = reverse ? `end != ${length - 1}` : `end != 0`;\n      idxString = reverse ? `end + 1` : `end - 1`;\n    } else {\n      condition = reverse ? `end + pow2 < ${length}` : `end >= pow2`;\n      idxString = (reverse ? `end + pow2` : `end - pow2`);\n    }\n\n    this.userCode = `\n    uniform float index;\n    void main() {\n      ${getCoordsDataType(rank)} coords = getOutputCoords();\n      int end = ${getFinalCoord(rank, 'coords')};\n      float val = ${val};\n      int pow2 = int(pow(2.0, index));\n      if (${condition}) {\n        int idx = ${idxString};\n        ${getFinalCoord(rank, 'coords')} = idx;\n        val += getX(${getCoords(rank, 'coords')});\n      }\n      setOutput(val);\n    }\n  `;\n\n  getCustomSetupFunc(index: number) {\n    return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n      if (this.index == null) {\n        this.index = gpgpu.getUniformLocation(webGLProgram, 'index');\n      }\n      gpgpu.gl.uniform1f(this.index, index);\n    }; \n  }\n\n  function getCoords(rank: number, name: string): string {\n    if (rank === 1) {\n      return `${name}`;\n    } else if (rank === 2) {\n      return `${name}.x, ${name}.y`;\n    } else if (rank === 3) {\n      return `${name}.x, ${name}.y, ${name}.z`;\n    } else if (rank === 4) {\n      return `${name}.x, ${name}.y, ${name}.z, ${name}.w`;\n    } else {\n      throw Error(`Cumulative sum for rank ${rank} is not yet supported`);\n    }\n  }\n\n  function getFinalCoord(rank: number, name: string): string {\n    if (rank === 1) {\n      return `${name}`;\n    } else if (rank === 2) {\n      return `${name}.y`;\n    } else if (rank === 3) {\n      return `${name}.z`;\n    } else if (rank === 4) {\n      return `${name}.w`;\n    } else {\n      throw Error(`Cumulative sum for rank ${rank} is not yet supported`);\n    }\n  }\n}\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
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```
=====
*\n\nimport {backend_util, Cumsum, CumsumAttrs, CumsumInputs, KernelConfig, KernelFunc, TensorInfo} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport {CumSumProgram}
from './cumsum_gpu';\n\nimport {identity} from './Identity';\n\nimport {transpose} from './Transpose';\n\nexport
function cumsum(\n  args:\n    {inputs: CumsumInputs, backend: MathBackendWebGL, attrs: CumsumAttrs});\n\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {axis, exclusive, reverse} =
attrs;\n\n    const xRank = x.shape.length;\n    const permutation = backend_util.getAxesPermutation([axis], xRank);\n\n    let permutedX = x;\n    if (permutation != null) {\n      permutedX = transpose({inputs: {x}, backend, attrs: {perm:
permutation}});\n    }\n    const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n\n    if (permutedAxis
!== xRank - 1) {\n      throw new Error(\n        `WebGL cumsum shader expects an inner-most axis=${\n
x.shape.length - 1}` +\n        `but got axis=${axis}`);\n    }\n    const size = permutedX.shape[permutedAxis];\n\n    let
result = identity({inputs: {x: permutedX}, backend});\n    // Use cumsum parallel algorithm, ref:\n    //
https://developer.nvidia.com/gpugems/gpugems3/part-vi-gpu-computing/chapter-39-parallel-prefix-sum-scan-
cuda\n\n    for (let i = 0; i <= Math.ceil(Math.log2(size)) - 1; i++) {\n      const program = new
CumSumProgram(permutedX.shape, false, reverse);\n      const customSetup = program.getCustomSetupFunc(i);\n\n      const
prevResult = result;\n      result =\n        backend.runWebGLProgram(program, [result], result.dtype,
customSetup);\n      backend.disposeIntermediateTensorInfo(prevResult);\n    }\n    // For exclusive cumsum, shift the
end result in the direction of sum\n    // and add 0 to the front index.\n    if (exclusive) {\n      const program = new
CumSumProgram(permutedX.shape, exclusive, reverse);\n      const prevResult = result;\n      result =
backend.runWebGLProgram(program, [result], result.dtype);\n\n      backend.disposeIntermediateTensorInfo(prevResult);\n    }\n\n    if (permutation != null) {\n      const
reversePermutation = backend_util.getUndoAxesPermutation(permutation);\n      const reverseTransposedResult =
transpose(\n        {inputs: {x: result}, backend, attrs: {perm: reversePermutation}});\n\n      backend.disposeIntermediateTensorInfo(result);\n      backend.disposeIntermediateTensorInfo(permutedX);\n\n      return
reverseTransposedResult;\n    }\n\n    return result;\n  }\n\nexport const cumsumConfig: KernelConfig = {\n
kernelName: Cumsum,\n  backendName: 'webgl',\n  kernelFunc: cumsum as { } as KernelFunc\n};\n\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====
*\n\nimport {DenseBincount, DenseBincountAttrs, DenseBincountInputs, KernelConfig, KernelFunc, TensorInfo,
TypedArray} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport
{bincountImplCPU, bincountReduceImplCPU} from './kernel_utils/shared';\n\nexport function denseBincount(args:
{\n  inputs: DenseBincountInputs,\n  backend: MathBackendWebGL,\n  attrs: DenseBincountAttrs\n}): TensorInfo
{\n  const {inputs, backend, attrs} = args;\n  const {x, weights} = inputs;\n  const {size, binaryOutput} = attrs;\n\n  if (x.shape.length === 1) {\n    const xVals = backend.readSync(x.dataId) as TypedArray;\n    const weightsVals =
backend.readSync(weights.dataId) as TypedArray;\n\n    const outVals =\n      bincountImplCPU(xVals,
weightsVals, weights.dtype, weights.shape, size);\n\n    return backend.makeTensorInfo([size], weights.dtype,
outVals);\n  } else if (x.shape.length === 2) {\n    const xBuf = backend.bufferSync(x);\n    const weightsBuf =
backend.bufferSync(weights);\n    const outBuf = bincountReduceImplCPU(xBuf, weightsBuf, size,
binaryOutput);\n\n    return backend.makeTensorInfo(outBuf.shape, weights.dtype, outBuf.values);\n  }\n\n  throw
new Error(\n    `Error in denseBincount: input must be at most rank 2, but got rank` +\n
```

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`${x.shape.length}`);\n\nexport const denseBincountConfig: KernelConfig = {\n kernelName:
DenseBincount,\n backendName: 'webgl',\n kernelFunc: denseBincount as { } as KernelFunc\n};\n", "/*\n *
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the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class DepthToSpaceProgram implements
GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[] = [];\n userCode: string;\n blockSize:
number;\n dataFormat: string;\n\n constructor(\n   outputShape: number[], blockSize: number, dataFormat:
'NHWC'|'NCHW') {\n   this.outputShape = outputShape;\n   this.blockSize = blockSize;\n   this.dataFormat =
dataFormat;\n   this.userCode = \n   void main() {\n     ivec4 coords = getOutputCoords();\n     int b =
coords[0];\n     int h = ${this.getHeightCoordString()};\n     int w = ${this.getWidthCoordString()};\n     int d =
${this.getDepthCoordString()};\n\n     int in_h = h / ${blockSize};\n     int offset_h = imod(h, ${blockSize});\n
int in_w = w / ${blockSize};\n     int offset_w = imod(w, ${blockSize});\n     int offset_d = (offset_h *
${blockSize} + offset_w) *\n     ${this.getOutputDepthSize()};\n     int in_d = d + offset_d;\n\n     float result =
${this.getInputSamplingString()};\n     setOutput(result);\n   }\n\n   private getHeightCoordString(): string
{\n   if (this.dataFormat === 'NHWC') {\n     return `coords[1]`;}\n   } else {\n     return `coords[2]`;}\n   }\n\n   private
getWidthCoordString(): string {\n   if (this.dataFormat === 'NHWC') {\n     return `coords[2]`;}\n   } else
{\n     return `coords[3]`;}\n   }\n\n   private getDepthCoordString(): string {\n   if (this.dataFormat ===
'NHWC') {\n     return `coords[3]`;}\n   } else {\n     return `coords[1]`;}\n   }\n\n   private
getOutputDepthSize(): number {\n   if (this.dataFormat === 'NHWC') {\n     return this.outputShape[3];}\n   } else
{\n     return this.outputShape[1];}\n   }\n\n   private getInputSamplingString(): string {\n   if (this.dataFormat
=== 'NHWC') {\n     return `getX(b, in_h, in_w, in_d)`;\n   } else {\n     return `getX(b, in_d, in_h, in_w)`;\n   }\n
}\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport
{DepthToSpaceProgram} from './depth_to_space_gpu';\n\nexport function depthToSpace(args: {\n inputs:
DepthToSpaceInputs,\n backend: MathBackendWebGL,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const
{inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n util.assert(\n
blockSize > 1, \n   () => `blockSize should be > 1 for depthToSpace, but was: ${blockSize}`);\n\n const batchSize
= x.shape[0];\n const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth =
(dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3]
: x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n
const outputDepth = inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n
[batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight,
outputWidth];\n\n const program = new DepthToSpaceProgram(outputShape, blockSize, dataFormat);\n return
backend.runWebGLProgram(program, [x], x.dtype);\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n
kernelName: DepthToSpace,\n backendName: 'webgl',\n kernelFunc: depthToSpace as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the

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=====
/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class DepthwiseConv2DProgram implements GPGPUProgram {\n  variableNames = ['x',
'W'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    convInfo: backend_util.Conv2DInfo,\n    addBias = false,\n    activation: string = null, hasPreluActivation = false,\n    hasLeakyReluAlpha = false) {\n    this.outputShape = convInfo.outShape;\n\n    const xNumRows = convInfo.inHeight;\n    const xNumCols =
convInfo.inWidth;\n    const padTop = convInfo.padInfo.top;\n    const padLeft = convInfo.padInfo.left;\n    const
strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationHeight =
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const filterHeight =
convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const channelMul = convInfo.outChannels /
convInfo.inChannels;\n\n    let activationSnippet = ", applyActivationSnippet = ";\n    if (activation) {\n      if
(hasPreluActivation) {\n        activationSnippet = `float activation(float a) {\n          float b =
getPreluActivationWeightsAtOutCoords();\n          ${activation}\n          }`;\n        } else if (hasLeakyReluAlpha) {\n
activationSnippet = `float activation(float a) {\n          float b = getLeakyreluAlphaAtOutCoords();\n
${activation}\n          }`;\n        } else {\n          activationSnippet = `\n          float activation(float x) {\n
${activation}\n          }\n          `;\n        }\n      }\n      applyActivationSnippet = `result = activation(result);`;\n    }\n\n    const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords()';\n    if (addBias) {\n
this.variableNames.push('bias');\n    }\n\n    if (hasPreluActivation) {\n
this.variableNames.push('preluActivationWeights');\n    }\n    if (hasLeakyReluAlpha) {\n
this.variableNames.push('leakyreluAlpha');\n    }\n\n    this.userCode = `\n    ${activationSnippet}\n\n    const
ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n    const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n    void main() {\n      ivec4 coords = getOutputCoords();\n      int batch = coords.x;\n      ivec2 xRCCorner =
coords.yz * strides - pads;\n      int d2 = coords.w;\n      int d1 = d2 / ${channelMul};\n      int q = d2 - d1 *
${channelMul};\n\n      int xRCorner = xRCCorner.x;\n      int xCCorner = xRCCorner.y;\n\n      // Convolve x(?,
?, d1) with w(:, :, d1, q) to get y(yR, yC, d2).\n      // ? = to be determined. : = across all values in that axis.\n      float dotProd = 0.0;\n      // TO DO(dsmilkov): Flatten the two for loops and vec4 the operations.\n      for (int wR
= 0; wR < ${filterHeight}; wR++) {\n        int xR = xRCorner + wR * ${dilationHeight};\n\n        if (xR < 0 || xR
>= ${xNumRows}) {\n          continue;\n        }\n\n        for (int wC = 0; wC < ${filterWidth}; wC++) {\n
int xC = xCCorner + wC * ${dilationWidth};\n\n        if (xC < 0 || xC >= ${xNumCols}) {\n          continue;\n
}\n\n        float xVal = getX(batch, xR, xC, d1);\n        float wVal = getW(wR, wC, d1, q);\n        dotProd
+= xVal * wVal;\n        }\n      }\n\n      float result = dotProd;\n      ${addBiasSnippet}\n      ${applyActivationSnippet}\n      setOutput(result);\n    }\n  }\n}\n\n"/**\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
=====
```

```
/\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class DepthwiseConvPacked2DProgram implements GPGPUProgram {\n  variableNames
= ['x', 'W'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n}
```

```

constructor(\n  convInfo: backend_util.Conv2DInfo, addBias = false,\n  activation: string = null,\n  hasPreluActivation = false,\n  hasLeakyReluAlpha = false) {\n  this.outputShape = convInfo.outShape;\n\n  const xNumRows = convInfo.inHeight;\n  const xNumCols = convInfo.inWidth;\n  const padTop = convInfo.padInfo.top;\n  const padLeft = convInfo.padInfo.left;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const texelsAcross = filterWidth;\n\n  let mainLoop = `int xR; int xC; int xCOffset;`\n  for (let r = 0; r < filterHeight; r++) {\n    for (let c = 0; c < filterWidth; c++) {\n      mainLoop += `\n      vec4\n      xTexelR${r}C${c * 2} = vec4(0.);\n      vec4 wR${r}C${c} = vec4(0.);\n      vec4 xR${r}C${c} = vec4(0.);`\n    }\n  }\n\n  /**\n   * This vectorized implementation works by gathering the values needed for\n   * each output channel's dot product into vec4's and then multiplying them\n   * all together (this happens in the final double for-loop below). Most of\n   * the main loop consists of constructing these vec4's with the minimum\n   * number of texture2D calls, which means making use of all four returned\n   * values from a texture2D call at once.\n   */\n  for (let r = 0; r < filterHeight; r++) {\n    for (let texelC = 0; texelC < texelsAcross; texelC++) {\n      const c = texelC * 2;\n      mainLoop += `\n      xR = xRCorner + ${r * dilationHeight};\n      xC = xCCorner + ${c * dilationWidth};\n      `;\n      if (strideWidth === 1) {\n        if (c < filterWidth) {\n          // If padding is odd, the outer texels have to be composed.\n          if (padLeft % 2 === 1) {\n            // TODO: Ensure vec4 previous does not result in redundant sample,\n            // and avoid setting xTexelRC's that exceed the boundary in the\n            // first place rather than resetting them to vec4(0).\n            // To compute xCOffset:\n            // - If padding is odd, we must add 1 to ensure we ask for an\n            // even-numbered row.\n            // - We subtract 2 to access the previous texel.\n            mainLoop += `\n            xCOffset = xC + 1;\n          `;\n          if (xR >= 0 && xR < ${xNumRows} && xCOffset >= 0 && xCOffset < ${\n            xNumCols}) {\n            xTexelR${r}C${c} = getX(batch, xR, xCOffset, d1);\n            // Need to manually clear unused channels in case\n            // we're reading from recycled texture.\n            if (xCOffset + 1 >= ${xNumCols}) {\n              xTexelR${r}C${c}.zw = vec2(0.); \n            } else {\n              xTexelR${r}C${c} = vec4(0.); \n            }\n            xCOffset = xC + 1 - 2;\n            if (xR >= 0 && xR < ${xNumRows} && xCOffset >= 0 && xCOffset < ${\n              xNumCols}) {\n              vec4 previous = getX(batch, xR, xCOffset, d1);\n              // Need to manually clear unused channels in case\n              // we're reading from recycled texture.\n              if (xCOffset + 1 >= ${xNumCols}) {\n                previous.zw = vec2(0.); \n              }\n              xR${r}C${c} = vec4(previous.zw, xTexelR${r}C${c}.xy);\n            } else {\n              xR${r}C${c} = vec4(0, 0, xTexelR${r}C${c}.xy);\n            }\n            `;\n            } else {\n              // Padding is even, so xRC corresponds to a single texel.\n              mainLoop += `\n              if (xR >= 0 && xR < ${xNumRows} && xC >= 0 && xC < ${xNumCols}) {\n                xTexelR${r}C${c} = getX(batch, xR, xC, d1);\n              } else {\n                xTexelR${r}C${c} = vec4(0.); \n              }\n              xR${r}C${c} = xTexelR${r}C${c};\n            `;\n            }\n            }\n            if (c + 1 < filterWidth) {\n              // If dilation is even, the second entry should match the first\n              // (either both are composed or both are single samples). But if\n              // dilation is odd, then the second entry should be the opposite\n              // of the first (if the first is composed, the second is a single\n              // sample, and vice versa.)\n              const nextTexelOffset = padLeft % 2 === 0 ?\n                util.nearestLargerEven(dilationWidth) :\n                dilationWidth;\n              if ((dilationWidth % 2 === 0 && padLeft % 2 === 1) ||\n                (dilationWidth % 2 !== 0 && padLeft % 2 !== 1)) {\n                mainLoop += `\n                xCOffset = xC + ${padLeft % 2} + ${nextTexelOffset};\n              `;\n              if (xR >= 0 && xR < ${xNumRows} &&\n                xCOffset >= 0 && xCOffset < ${xNumCols}) {\n                xTexelR${r}C${c + 2} = getX(batch, xR, xCOffset, d1);\n              }\n            `;\n            // If dilation > 1 then the xRC's will not be able to share any\n            // values, so each xRC will require two unique calls to getX.\n            if (dilationWidth > 1) {\n              mainLoop += `\n              xCOffset -= 2;\n            `;\n            if (xR >= 0 && xR < ${xNumRows} &&\n              xCOffset >= 0 && xCOffset < ${xNumCols}) {\n                xTexelR${r}C${c} = getX(batch, xR, xCOffset, d1);\n              } else {\n                xTexelR${r}C${c} = vec4(0.); \n              }\n            `;\n            }\n            }\n            mainLoop += `\n            xR${r}C${c + 1} =

```


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```
=====\n*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, env, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from './backend_webgl';\nimport {DepthwiseConv2DProgram} from
'./conv_gpu_depthwise';\nimport {DepthwiseConvPacked2DProgram} from
'./conv_packed_gpu_depthwise';\n\nexport function depthwiseConv2dNative(args: {\n inputs:
DepthwiseConv2dNativeInputs,\n attrs: DepthwiseConv2dNativeAttrs,\n backend: MathBackendWebGL\n}) {\n
const {inputs, backend, attrs} = args;\n const {x, filter} = inputs;\n const {strides, pad, dilations,
dimRoundingMode} = attrs;\n\n let $dilations = dilations;\n if ($dilations == null) {\n $dilations = [1, 1];\n }\n\n
util.assert(\n backend_util.eitherStridesOrDilationsAreOne(strides, $dilations),\n () => 'Error in
depthwiseConv2d: Either strides or dilations must be '+\n `1. Got strides ${strides} and dilations
'${$dilations}');\n\n const convInfo = backend_util.computeConv2DInfo(\n x.shape as [number, number,
number, number],\n filter.shape as [number, number, number, number], strides, $dilations,\n pad,
dimRoundingMode, true /* depthwise */);\n\n let program:
DepthwiseConv2DProgram|DepthwiseConvPacked2DProgram;\n if
(env().getBool('WEBGL_PACK_DEPTHWISECONV') && convInfo.strideWidth <= 2 &&\n
convInfo.outChannels / convInfo.inChannels === 1) {\n program = new
DepthwiseConvPacked2DProgram(convInfo);\n } else {\n program = new
DepthwiseConv2DProgram(convInfo);\n }\n\n return backend.runWebGLProgram(program, [x, filter],
'float32');\n}\n\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName:
DepthwiseConv2dNative,\n backendName: 'webgl',\n kernelFunc: depthwiseConv2dNative as {} as
KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

```
=====\n*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class DepthwiseConv2DDerFilterProgram implements GPGPUProgram {\n
variableNames = ['x', 'dy'];\n outputShape: number[];\n userCode: string;\n\n constructor(convInfo:
backend_util.Conv2DInfo) {\n this.outputShape = convInfo.filterShape;\n\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const padTop = convInfo.padInfo.top;\n
const padLeft = convInfo.padInfo.left;\n const channelMul = convInfo.outChannels / convInfo.inChannels;\n\n
this.userCode = `\n void main() {\n ivec4 coords = getOutputCoords();\n int wR = coords.x;\n int
wC = coords.y;\n int d1 = coords.z;\n int dm = coords.w;\n int d2 = d1 * ${channelMul} + dm;\n\n
float dotProd = 0.0;\n // TO DO: Vec4 over the batch size\n for (int b = 0; b < ${convInfo.batchSize};
b++) {\n for (int yR = 0; yR < ${convInfo.outHeight}; yR++) {\n int xR = wR + yR * ${strideHeight} -
${padTop};\n\n if (xR < 0 || xR >= ${convInfo.inHeight}) {\n continue;\n }\n\n for (int
yC = 0; yC < ${convInfo.outWidth}; yC++) {\n int xC = wC + yC * ${strideWidth} - ${padLeft};\n\n
if (xC < 0 || xC >= ${convInfo.inWidth}) {\n continue;\n }\n\n float dyValue = getDy(b,
yR, yC, d2);\n float xValue = getX(b, xR, xC, d1);\n dotProd += (xValue * dyValue);\n }\n\n
}\n\n\n`;\n\n }\n\n}\n\n\n
```

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    }\n    }\n    setOutput(dotProd);\n    }\n    `;\n    }\n}\n\nexport class DepthwiseConv2DDerInputProgram
implements GPGPUProgram {\n    variableNames = ['dy', 'W'];\n    outputShape: number[];\n    userCode: string;\n\n    constructor(convInfo: backend_util.Conv2DInfo) {\n        this.outputShape = convInfo.inShape;\n\n        const
filterHeight = convInfo.filterHeight;\n        const filterWidth = convInfo.filterWidth;\n        const strideHeight =
convInfo.strideHeight;\n        const strideWidth = convInfo.strideWidth;\n        const padTop = filterHeight - 1 -
convInfo.padInfo.top;\n        const padLeft = filterWidth - 1 - convInfo.padInfo.left;\n        const channelMul =
convInfo.outChannels / convInfo.inChannels;\n\n        this.userCode = `\n        const ivec2 pads = ivec2(${padTop},
${padLeft});\n\n        void main() {\n            ivec4 coords = getOutputCoords();\n            int batch = coords[0];\n            int
d1 = coords[3];\n            ivec2 dyCorner = coords.yz - pads;\n            int dyRCorner = dyCorner.x;\n            int dyCCorner =
dyCorner.y;\n            float dotProd = 0.0;\n            for (int wR = 0; wR < ${filterHeight}; wR++) {\n                float dyR
= float(dyRCorner + wR) / ${strideHeight}.0;\n                if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||
fract(dyR) > 0.0) {\n                    continue;\n                }\n                int idyR = int(dyR);\n                int wRPerm = ${filterHeight} -
1 - wR;\n\n                for (int wC = 0; wC < ${filterWidth}; wC++) {\n                    float dyC = float(dyCCorner + wC) /
${strideWidth}.0;\n                    if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n                        fract(dyC) > 0.0) {\n
                        continue;\n                    }\n                    int idyC = int(dyC);\n                    int wCPerm = ${filterWidth} - 1 - wC;\n\n                    //
TO DO: Vec4 over the channelMul\n                    for (int dm = 0; dm < ${channelMul}; dm++) {\n                        int d2 = d1 *
${channelMul} + dm;\n                        float xValue = getDy(batch, idyR, idyC, d2);\n                        float wValue =
getW(wRPerm, wCPerm, d1, dm);\n                        dotProd += xValue * wValue;\n                    }\n                }\n            }\n        }\n    }\n    setOutput(dotProd);\n    }\n    `;\n    }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
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*\n\nimport {backend_util, DepthwiseConv2dNativeBackpropFilter, DepthwiseConv2dNativeBackpropFilterAttrs,
DepthwiseConv2dNativeBackpropFilterInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {DepthwiseConv2DDerFilterProgram} from
'./conv_backprop_gpu_depthwise';\n\nexport function depthwiseConv2dNativeBackpropFilter(args: {\n    inputs:
DepthwiseConv2dNativeBackpropFilterInputs,\n    attrs: DepthwiseConv2dNativeBackpropFilterAttrs,\n    backend:
MathBackendWebGL\n}) {\n    const {inputs, backend, attrs} = args;\n    const {x, dy} = inputs;\n    const {strides,
dilations, pad, dimRoundingMode, filterShape} = attrs;\n\n    const convInfo = backend_util.computeConv2DInfo(\n
x.shape as [number, number, number, number], filterShape, strides,\n    dilations, pad, dimRoundingMode, true /*
depthwise */);\n\n    const program = new DepthwiseConv2DDerFilterProgram(convInfo);\n    return
backend.runWebGLProgram(program, [x, dy], 'float32');\n}\n\nexport const
depthwiseConv2dNativeBackpropFilterConfig: KernelConfig = {\n    kernelName:
DepthwiseConv2dNativeBackpropFilter,\n    backendName: 'webgl',\n    kernelFunc:
depthwiseConv2dNativeBackpropFilter as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

*\n\nimport {backend_util, DepthwiseConv2dNativeBackpropInput, DepthwiseConv2dNativeBackpropInputAttrs,
DepthwiseConv2dNativeBackpropInputInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport

```

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{MathBackendWebGL} from './backend_webgl';\nimport {DepthwiseConv2DDerInputProgram} from
'./conv_backprop_gpu_depthwise';\n\nexport function depthwiseConv2dNativeBackpropInput(args: {\n inputs:
DepthwiseConv2dNativeBackpropInputInputs,\n attrs: DepthwiseConv2dNativeBackpropInputAttrs,\n backend:
MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {dy, filter} = inputs;\n const {strides,
dilations, pad, dimRoundingMode, inputShape} = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
true /* depthwise */);\n\n const program = new DepthwiseConv2DDerInputProgram(convInfo);\n return
backend.runWebGLProgram(program, [dy, filter], 'float32');\n}\n\nexport const
depthwiseConv2dNativeBackpropInputConfig: KernelConfig = {\n kernelName:
DepthwiseConv2dNativeBackpropInput,\n backendName: 'webgl',\n kernelFunc:
depthwiseConv2dNativeBackpropInput as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\nimport {GPGPUProgram} from './gpgpu_math';\nexport class DiagProgram implements GPGPUProgram
{\n variableNames = ['X'];\n outputShape: number[];\n userCode: string;\n\n constructor(size: number) {\n
this.outputShape = [size, size];\n this.userCode = `\n void main() {\n ivec2 coords = getOutputCoords();\n
float val = coords[0] == coords[1] ? getX(coords[0]) : 0.0;\n  setOutput(val);\n }\n `;\n }\n}\n\n"/**\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Diag, DiagInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-
core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {DiagProgram} from
'./diag_gpu';\nimport {reshape} from './Reshape';\n\nexport function diag(args: {inputs: DiagInputs, backend:
MathBackendWebGL});\n TensorInfo {\n const {inputs, backend} = args;\n const {x} = inputs;\n\n const
outShape = [...x.shape, ...x.shape];\n const xSize = util.sizeFromShape(x.shape);\n\n const flat = reshape({inputs:
{x}, backend, attrs: {shape: [xSize]}});\n\n const program = new DiagProgram(xSize);\n const res =
backend.runWebGLProgram(program, [flat], flat.dtype);\n\n const out = reshape({inputs: {x: res}, backend, attrs:
{shape: outShape}});\n\n backend.disposeIntermediateTensorInfo(flat);\n\n
backend.disposeIntermediateTensorInfo(res);\n\n return out;\n}\n\nexport const diagConfig: KernelConfig = {\n
kernelName: Diag,\n backendName: 'webgl',\n kernelFunc: diag as {} as KernelFunc\n};\n\n"/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class Dilation2DProgram implements GPGPUProgram {\n variableNames = ['x', 'W'];\n

```

```

outputShape: number[];\n userCode: string;\n\n constructor(convInfo: backend_util.Conv2DInfo) {\n
this.outputShape = convInfo.outShape;\n\n const {\n  inHeight,\n  inWidth,\n  padInfo,\n  strideHeight,\n  strideWidth,\n  filterHeight,\n  filterWidth,\n  dilationHeight,\n  dilationWidth\n } = convInfo;\n\n
const {top: padTop, left: padLeft} = padInfo;\n\n this.userCode = `\n  const ivec2 strides =
ivec2(${strideHeight}, ${strideWidth});\n  const ivec2 pads = ivec2(${padTop}, ${padLeft});\n  const float
neg_infinity = -3.4e38;\n\n  void main() {\n    ivec4 coords = getOutputCoords();\n    int batch = coords.x;\n    int d1 = coords.w;\n    ivec2 outTopLeftCorner =\n      coords.yz * strides - pads;\n    int hBeg =
outTopLeftCorner.x;\n    int wBeg = outTopLeftCorner.y;\n\n    float curVal = neg_infinity;\n    for (int h =
0; h < ${filterHeight}; h++) {\n      int hIn = hBeg + h * ${dilationHeight};\n\n      if (hIn >= 0 && hIn <
${inHeight}) {\n        for (int w = 0; w < ${filterWidth}; w++) {\n          int wIn = wBeg + w *
${dilationWidth};\n\n          if (wIn >= 0 && wIn < ${inWidth}) {\n            float xVal = getX(batch, hIn, wIn,
d1);\n            float wVal = getW(h, w, d1);\n            float val = xVal + wVal;\n            if (val > curVal) {\n
              curVal = val;\n            }\n          }\n        }\n      }\n\n      float result = curVal;\n
setOutput(result);\n    }\n  `;\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, Dilation2D, Dilation2DAttrs, Dilation2DInputs, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport
{Dilation2DProgram} from './dilation_gpu';\n\nimport {reshape} from './Reshape';\n\n\nexport function
dilation2D(args: {\n  inputs: Dilation2DInputs,\n  attrs: Dilation2DAttrs,\n  backend: MathBackendWebGL\n}) {\n
const {inputs, backend, attrs} = args;\n  const {x, filter} = inputs;\n  const {strides, pad, dilations} = attrs;\n\n  const
convInfo = backend_util.computeDilation2DInfo(\n    x.shape as [number, number, number, number],\n
filter.shape as [number, number, number], strides, pad,\n    'NHWC' /* dataFormat */, dilations);\n  let out:
TensorInfo;\n\n  const program = new Dilation2DProgram(convInfo);\n  out =
backend.runWebGLProgram(program, [x, filter], 'float32');\n\n  const outReshaped =\n    reshape({inputs: {x: out},
backend, attrs: {shape: convInfo.outShape}});\n\n  backend.disposeIntermediateTensorInfo(out);\n\n  return
outReshaped;\n}\n\n\nexport const dilation2DConfig: KernelConfig = {\n  kernelName: Dilation2D,\n  backendName:
'webgl',\n  kernelFunc: dilation2D as {} as KernelFunc,\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC.
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {Elu, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\n\nconst ELU = `return (x >= 0.0) ? x : (exp(x) - 1.0);`\n\nconst ELU_PACKED
= `\n  vec4 result;\n\n  result.r = (x.r >= 0.0) ? x.r : (exp(x.r) - 1.0);\n  result.g = (x.g >= 0.0) ? x.g : (exp(x.g) -
1.0);\n  result.b = (x.b >= 0.0) ? x.b : (exp(x.b) - 1.0);\n  result.a = (x.a >= 0.0) ? x.a : (exp(x.a) - 1.0);\n\n  return
result;\n`;\n\n\nconst elu = unaryKernelFunc({opSnippet: ELU, packedOpSnippet: ELU_PACKED});\n\n\nexport const
eluConfig: KernelConfig = {\n  kernelName: Elu,\n  backendName: 'webgl',\n  kernelFunc: elu as {} as
KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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```

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```
=====\n*\n\nimport {EluGrad, EluGradInputs, env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {BinaryOpProgram} from '../binaryop_gpu';\nimport {BinaryOpPackedProgram} from '../binaryop_packed_gpu';\nconst ELU_DER = `return (b >= 1.0) ? a : a * (b + 1.0);`\nconst ELU_DER_PACKED = `\n  vec4 bGTEZero = vec4(greaterThanEqual(b, vec4(0.)));\n  return (bGTEZero * a) + ((vec4(1.0) - bGTEZero) * (a * (b + vec4(1.0)))));\n`;\n\nexport const eluGrad = (\n  args: {inputs: EluGradInputs, backend: MathBackendWebGL}: TensorInfo => {\n    const {inputs, backend} = args;\n    const {dy, y} = inputs;\n\n    const program = env().getBool('WEBGL_PACK_BINARY_OPERATIONS') ?\n      new BinaryOpPackedProgram(ELU_DER_PACKED, dy.shape, y.shape) :\n      new BinaryOpProgram(ELU_DER, dy.shape, y.shape);\n    return backend.runWebGLProgram(program, [dy, y], dy.dtype);\n  });\n\nexport const eluGradConfig: KernelConfig = {\n  kernelName: EluGrad,\n  backendName: 'webgl',\n  kernelFunc: eluGrad as { } as KernelFunc\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Equal, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nconst PACKED_EQUAL = `\n  return vec4(equal(a, b));\n`;\nconst EQUAL = `return float(a == b);`\n\nexport const equal = binaryKernelFunc(\n  {opSnippet: EQUAL, packedOpSnippet: PACKED_EQUAL, dtype: 'bool'});\n\nexport const equalConfig: KernelConfig = {\n  kernelName: Equal,\n  backendName: 'webgl',\n  kernelFunc: equal as { } as KernelFunc\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {backend_util, Erf, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nconst ERF = `\n  // Error function is calculated approximately with elementary function.\n  // See \"Handbook of Mathematical Functions with Formulas,\n  // Graphs, and Mathematical Tables\", Abramowitz and Stegun.\n  float p = ${backend_util.ERF_P};\n  float a1 = ${backend_util.ERF_A1};\n  float a2 = ${backend_util.ERF_A2};\n  float a3 = ${backend_util.ERF_A3};\n  float a4 = ${backend_util.ERF_A4};\n  float a5 = ${backend_util.ERF_A5};\n\n  float sign = sign(x);\n  x = abs(x);\n  float t = 1.0 / (1.0 + p * x);\n  return sign * (1.0 - (((((a5*t + a4)*t) + a3)*t + a2)*t + a1)*t*exp(-x*x));\n`;\n\nexport const erf = unaryKernelFunc({opSnippet: ERF});\n\nexport const erfConfig: KernelConfig = {\n  kernelName: Erf,\n  backendName: 'webgl',\n  kernelFunc: erf,\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required
```


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```
=====  
*import {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, TensorInfo, util}  
from '@tensorflow/tfjs-core';import {MathBackendWebGL} from './backend_webgl';import {reshape} from  
 './Reshape';export function expandDims(args: {inputs: ExpandDimsInputs, attrs: ExpandDimsAttrs,  
 backend: MathBackendWebGL}): TensorInfo {const {inputs, attrs, backend} = args;const {dim} = attrs;  
const {input} = inputs;const inputRank = input.shape.length;const newShape = input.shape.slice();  
let $dim = dim;if (dim < 0) { // Negative value is counted from the tail of rank.util.assert(  
 -(inputRank + 1) <= dim, () => `Axis must be in the interval [${-(inputRank + 1)}, ${inputRank}]`);  
 $dim = inputRank + dim + 1;}newShape.splice($dim, 0, 1);return reshape({inputs: {x: input}, backend, attrs:  
 {shape: newShape}});}export const expandDimsConfig: KernelConfig = {kernelName: ExpandDims,  
 backendName: 'webgl', kernelFunc: expandDims as {} as KernelFunc};  
=====  
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 OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language  
 governing permissions and limitations under the License.
```

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=====  
*import {GPGPUProgram} from './gpgpu_math';export class FFTProgram implements GPGPUProgram {  
 variableNames = ['real', 'imag'];outputShape: number[];userCode: string;constructor(  
 component: 'real'|'imag', inputShape: [number, number], inverse: boolean) {const innerDim = inputShape[1];  
 this.outputShape = inputShape;const exponentMultiplierSnippet = inverse ? `2.0 * ${Math.PI}` : `-.2.0 *  
 ${Math.PI}`;const resultDenominator = inverse ? `${innerDim}.0` : '1.0';let opString: string;  
 if (component === 'real') {opString = 'return real * expR - imag * expI;'} else if (component === 'imag') {  
 opString = 'return real * expI + imag * expR;'} else {throw new Error(`FFT component must  
 be either "real" or "imag", got ${component}`);}this.userCode = `const float exponentMultiplier  
 = ${exponentMultiplierSnippet};float unaryOpComplex(float real, float expR, float imag, float expI) {  
 ${opString};float mulMatDFT(int batch, int index) {float indexRatio = float(index) /  
 float(${innerDim});float exponentMultiplierTimesIndexRatio = exponentMultiplier *  
 indexRatio;float result = 0.0;for (int i = 0; i < ${innerDim}; i++) { // x = (-2|2 * PI / N) *  
 index * i;float x = exponentMultiplierTimesIndexRatio * float(i);float expR = cos(x);float  
 expI = sin(x);float real = getReal(batch, i);float imag = getImag(batch, i);result +=  
 unaryOpComplex(real, expR, imag, expI) / ${resultDenominator};}return result;}  
 void main() {ivec2 coords = getOutputCoords();setOutput(mulMatDFT(coords[0], coords[1]));}  
 }`;  
 }  
=====  
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 software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language  
 governing permissions and limitations under the License.
```

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=====  
*import {TensorInfo, util} from '@tensorflow/tfjs-core';import {MathBackendWebGL} from  
 './backend_webgl';import {FFTProgram} from './fft_gpu';import {complex} from './Complex';import  
 {reshape} from './Reshape';export function fftImpl(x: TensorInfo, inverse: boolean, backend:
```

```

MathBackendWebGL): TensorInfo {\n  const xData = backend.texData.get(x.dataId);\n  const inputSize = util.sizeFromShape(x.shape);\n  // Collapse all outer dimensions to a single batch dimension.\n  const innerDimensionSize = x.shape[x.shape.length - 1];\n  const batch = inputSize / innerDimensionSize;\n  const input2D = reshape(\n    {inputs: {x}, backend, attrs: {shape: [batch, innerDimensionSize]}});\n  const xShape = input2D.shape as [number, number];\n  const realProgram = new FFTProgram('real', xShape, inverse);\n  const imagProgram = new FFTProgram('imag', xShape, inverse);\n  const inputs = [\n    {\n      dataId: xData.complexTensorInfos.real.dataId,\n      dtype: xData.complexTensorInfos.real.dtype,\n      shape: xShape\n    },\n    {\n      dataId: xData.complexTensorInfos.imag.dataId,\n      dtype: xData.complexTensorInfos.imag.dtype,\n      shape: xShape\n    }\n  ];\n  const realPart = backend.runWebGLProgram(realProgram, inputs, 'float32');\n  const imagPart = backend.runWebGLProgram(imagProgram, inputs, 'float32');\n  const complexOutput =\n    complex({inputs: {real: realPart, imag: imagPart}, backend});\n  backend.disposeIntermediateTensorInfo(realPart);\n  backend.disposeIntermediateTensorInfo(imagPart);\n  const complexOutputReshaped =\n    reshape({inputs: {x: complexOutput}, backend, attrs: {shape: x.shape}});\n  backend.disposeIntermediateTensorInfo(input2D);\n  backend.disposeIntermediateTensorInfo(complexOutput);\n  return complexOutputReshaped;\n}\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *import {FFT, FFTInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n *import {MathBackendWebGL} from '../backend_webgl';\n *import {fftImpl} from './FFT_impl';\n *export function fft(args: {inputs: FFTInputs, backend: MathBackendWebGL}):\n *  TensorInfo {\n *    const {inputs, backend} = args;\n *    const {input} = inputs;\n *    return fftImpl(input, false /* inverse */, backend);\n *  }\n *export const fftConfig: KernelConfig = {\n *  kernelName: FFT,\n *  backendName: 'webgl',\n *  kernelFunc: fft;\n *};\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *import {GPGPUContext} from './gpgpu_context';\n *import {GPGPUProgram} from './gpgpu_math';\n *export class FillProgram implements GPGPUProgram {\n *  variableNames: string[];\n *  outputShape: number[] = [];\n *  userCode: string;\n *  valueLoc: WebGLUniformLocation;\n *  constructor(shape: number[], value: number) {\n *    this.variableNames = ['x'];\n *    this.outputShape = shape;\n *    this.userCode =`\n *      uniform float value;\n *      void main() {\n *        // Input can be obtained from uniform value.\n *        setOutput(value);\n *      }\n *    `;\n *  }\n *  getCustomSetupFunc(value: number) {\n *    return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) =>\n *    {\n *      if (this.valueLoc == null) {\n *        this.valueLoc = gpgpu.getUniformLocationNoThrow(webGLProgram,\n *          'value');\n *      }\n *      gpgpu.gl.uniform1f(this.valueLoc, value);\n *    };\n *  }\n *};\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {Fill, FillAttrs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from './backend_webgl';\n\nimport {FillProgram} from './fill_gpu';\n\nexport function
fill(args: {backend: MathBackendWebGL, attrs: FillAttrs}):\n  TensorInfo {\n  const {backend, attrs} = args;\n
const {shape, value} = attrs;\n  let {dtype} = attrs;\n\n  dtype = dtype || util.inferDtype(value);\n\n  if (dtype ===
'string') {\n  // String type should be handled in CPU memory.\n  const values = util.getArrayFromDType(dtype,
util.sizeFromShape(shape));\n  values.fill(value as string);\n  return backend.makeTensorInfo(shape, dtype,
values);\n  } else {\n  const program = new FillProgram(shape, value as number);\n  const customSetup =
program.getCustomSetupFunc(value as number);\n  return backend.runWebGLProgram(program, [], dtype,
customSetup);\n  }\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName: 'webgl',\n
kernelFunc: fill as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class FlipLeftRightProgram implements
GPGPUProgram {\n  variableNames = ['Image'];\n  outputShape: number[] = [];\n  userCode: string;\n\n  constructor(imageShape: [number, number, number, number]) {\n  const imageWidth = imageShape[2];\n
this.outputShape = imageShape;\n\n  this.userCode = `\n  void main() {\n  ivec4 coords =
getOutputCoords();\n  int x = coords[2];\n\n  int coordX = ${imageWidth} - x;\n  float
outputValue;\n  if(coordX >= 0 && coordX < ${imageWidth}) {\n  outputValue = getImage(coords[0],
coords[1], coordX, coords[3]);\n  } else {\n  outputValue = getImage(coords[0], coords[1], coords[2],
coords[3]);\n  }\n  setOutput(outputValue);\n  }\n  `;\n  }\n}\n", "/**\n * @license\n * Copyright 2020
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {KernelConfig, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {FlipLeftRight, FlipLeftRightInputs}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport
{FlipLeftRightProgram} from './flip_left_right_gpu';\n\nexport const flipLeftRightConfig: KernelConfig = {\n
kernelName: FlipLeftRight,\n  backendName: 'webgl',\n  kernelFunc: ({inputs, backend}) => {\n  const {image} =
inputs as FlipLeftRightInputs;\n  const webglBackend = backend as MathBackendWebGL;\n  const program =
new FlipLeftRightProgram((image as Tensor4D).shape);\n  const output =
webglBackend.runWebGLProgram(program, [image], image.dtype);\n  return output;\n  }\n};\n", "/**\n *
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```

=====
*\n\nimport {FloorDiv, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {binaryKernelFunc}

```

```

from './kernel_utils/kernel_funcs_utils';\n\n// We use native integer division to deal with floating point imprecision.
Since\n// we implement floor division and glsl implements truncated division, we\n// correct for this by subtracting 1
from result when the result is negative and\n// there is a remainder.\nconst INT_DIV = \n float s = sign(a) *
sign(b);\n int ia = round(a);\n int ib = round(b);\n if (ib != 0) {\n // Windows (D3D) wants guaranteed non-zero
int division at compile-time.\n return float(idiv(ia, ib, s));\n } else {\n return NAN;\n }\n\nconst
INT_DIV_PACKED = \n ivec4 ia = round(a);\n ivec4 ib = round(b);\n bvec4 cond = notEqual(ib, ivec4(0));\n
ivec4 result = ivec4(0);\n vec4 s = sign(a) * sign(b);\n\n // Windows (D3D) wants guaranteed non-zero int division
at compile-time.\n if (cond[0]) {\n result[0] = idiv(ia[0], ib[0], s[0]);\n }\n if (cond[1]) {\n result[1] =
idiv(ia[1], ib[1], s[1]);\n }\n if (cond[2]) {\n result[2] = idiv(ia[2], ib[2], s[2]);\n }\n if (cond[3]) {\n result[3] =
idiv(ia[3], ib[3], s[3]);\n }\n return vec4(result);\n`;\n\nexport const floorDiv = binaryKernelFunc(\n {opSnippet:
INT_DIV, packedOpSnippet: INT_DIV_PACKED, dtype: 'int32'});\n\nexport const floorDivConfig: KernelConfig
= {\n kernelName: FloorDiv,\n backendName: 'webgl',\n kernelFunc: floorDiv as {} as KernelFunc\n};\n`,"/*\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {getGlslDifferences} from '././glsl_version';\nimport {GPGPUProgram} from
'././gpgpu_math';\n\nexport class FromPixelsProgram implements GPGPUProgram {\n variableNames = ['A'];\n
userCode: string;\n outputShape: number[];\n\n constructor(outputShape: number[]) {\n const glsl =
getGlslDifferences();\n const [height, width, ] = outputShape;\n this.outputShape = outputShape;\n
this.userCode = \n void main() {\n ivec3 coords = getOutputCoords();\n int texR = coords[0];\n int
texC = coords[1];\n int depth = coords[2];\n vec2 uv = (vec2(texC, texR) + halfCR) / vec2(${width}.0,
${height}.0);\n\n vec4 values = ${glsl.texture2D}(A, uv);\n float value;\n if (depth == 0) {\n
value = values.r;\n } else if (depth == 1) {\n value = values.g;\n } else if (depth == 2) {\n value
= values.b;\n } else if (depth == 3) {\n value = values.a;\n }\n\n setOutput(floor(value * 255.0 +
0.5));\n }\n `;\n\n`,"/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {getGlslDifferences} from '././glsl_version';\nimport {GPGPUProgram} from
'././gpgpu_math';\n\nexport class FromPixelsPackedProgram implements GPGPUProgram {\n variableNames =
['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = false;\n packedOutput = true;\n\n
constructor(outputShape: number[]) {\n const glsl = getGlslDifferences();\n const [height, width, ] =
outputShape;\n this.outputShape = outputShape;\n this.userCode = \n void main() {\n ivec3 coords =
getOutputCoords();\n int texR = coords[0];\n int texC = coords[1];\n int depth = coords[2];\n\n
vec4 result = vec4(0.);\n for(int row=0; row<=1; row++) {\n for(int col=0; col<=1; col++) {\n
texC = coords[1] + row;\n depth = coords[2] + col;\n\n vec2 uv = (vec2(texC, texR) + halfCR) /\n
vec2(${width}.0, ${height}.0);\n vec4 values = ${glsl.texture2D}(A, uv);\n float value;\n
if (depth == 0) {\n value = values.r;\n } else if (depth == 1) {\n value = values.g;\n }
else if (depth == 2) {\n value = values.b;\n } else if (depth == 3) {\n value = values.a;\n
}\n\n result[row * 2 + col] = floor(value * 255.0 + 0.5);\n }\n }\n\n ${glsl.output} = result;\n

```

} \n `; \n } \n } \n", "/* \n * @license \n * Copyright 2019 Google LLC. All Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the "License"); \n * you may not use this file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n * http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or agreed to in writing, software \n * distributed under the License is distributed on an "AS IS" BASIS, \n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language governing permissions and \n * limitations under the License. \n *

```
===== \n
* \n \n import { env, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core'; \n import { FromPixels, FromPixelsAttrs, FromPixelsInputs } from '@tensorflow/tfjs-core'; \n import { MathBackendWebGL } from './backend_webgl'; \n import { TextureUsage } from './tex_util'; \n import { FromPixelsProgram } from './FromPixels_utils/from_pixels_gpu'; \n import { FromPixelsPackedProgram } from './FromPixels_utils/from_pixels_packed_gpu'; \n \n export const fromPixelsConfig: KernelConfig = { \n  kernelName: FromPixels, \n  backendName: 'webgl', \n  kernelFunc: fromPixels as { } as KernelFunc, \n }; \n \n let fromPixels2DContext: CanvasRenderingContext2D; \n \n function fromPixels(args: { \n  inputs: FromPixelsInputs, \n  backend: MathBackendWebGL, \n  attrs: FromPixelsAttrs \n }): TensorInfo { \n  const { inputs, backend, attrs } = args; \n  let { pixels } = inputs; \n  const { numChannels } = attrs; \n  \n  const isVideo = typeof (HTMLVideoElement) !== 'undefined' && \n    pixels instanceof HTMLVideoElement; \n  const isImage = typeof (HTMLImageElement) !== 'undefined' && \n    pixels instanceof HTMLImageElement; \n  const isImageBitmap = typeof (ImageBitmap) !== 'undefined' && \n    pixels instanceof ImageBitmap; \n  const [width, height] = isVideo ? \n    [ \n      (pixels as HTMLVideoElement).videoWidth, \n      (pixels as HTMLVideoElement).videoHeight \n    ] : \n    [pixels.width, pixels.height]; \n  \n  const texShape: [number, number] = [height, width]; \n  const outShape = [height, width, numChannels]; \n  \n  if (isImage || isVideo || isImageBitmap) { \n    if (fromPixels2DContext == null) { \n      fromPixels2DContext = document.createElement('canvas').getContext('2d'); \n    } \n    \n    fromPixels2DContext.canvas.width = width; \n    fromPixels2DContext.canvas.height = height; \n    \n    fromPixels2DContext.drawImage(\n      pixels as HTMLVideoElement | HTMLImageElement | ImageBitmap, \n      0, 0, width, height); \n    pixels = fromPixels2DContext.canvas; \n  } \n  \n  const tempPixelHandle = backend.makeTensorInfo(texShape, 'int32'); \n  // This is a byte texture with pixels. \n  backend.texData.get(tempPixelHandle.dataId).usage = TextureUsage.PIXELS; \n  \n  backend.gpgpu.uploadPixelDataToTexture(\n    backend.getTexture(tempPixelHandle.dataId), pixels as ImageData); \n  \n  const program = env().getBool('WEBGL_PACK') ? \n    new FromPixelsPackedProgram(outShape) : \n    new FromPixelsProgram(outShape); \n  \n  const res = backend.runWebGLProgram(program, [tempPixelHandle], 'int32'); \n  \n  backend.disposeData(tempPixelHandle.dataId); \n  \n  return res; \n } \n \n", "/* \n * @license \n * Copyright 2020 Google LLC. All Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the "License"); \n * you may not use this file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n * http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or agreed to in writing, software \n * distributed under the License is distributed on an "AS IS" BASIS, \n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language governing permissions and \n * limitations under the License. \n *
```

```
===== \n
* \n \n import { backend_util, env, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core'; \n import { MathBackendWebGL } from './backend_webgl'; \n import { Conv2DProgram } from './conv_gpu'; \n import { mapActivationToShaderProgram } from './kernel_utils/kernel_funcs_utils'; \n import { conv2dByMatMul, conv2dWithIm2Row } from './Conv2D_impl'; \n import { reshape } from './Reshape'; \n \n export function fusedConv2d(args: { \n  inputs: FusedConv2DInputs, \n  attrs: FusedConv2DAttrs, \n  backend: MathBackendWebGL \n }) { \n  const { inputs, backend, attrs } = args; \n  const { x, filter, bias, preluActivationWeights } = inputs; \n  const { \n    strides, \n    pad, \n    dataFormat, \n    dilations, \n    dimRoundingMode, \n    activation, \n    leakyreluAlpha \n } = attrs; \n  \n  const
```

```

$dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo =
backend_util.computeConv2DInfo(\n  x.shape as [number, number, number, number],\n  filter.shape as
[number, number, number, number], strides, dilations, pad,\n  dimRoundingMode, false /* depthwise */,
$dataFormat);\n let out: TensorInfo;\n const intermediates: TensorInfo[] = [];\n\n if (convInfo.filterHeight === 1
&& convInfo.filterWidth === 1 &&\n  convInfo.dilationHeight === 1 && convInfo.dilationWidth === 1 &&\n
convInfo.strideHeight === 1 && convInfo.strideWidth === 1 &&\n  (convInfo.padInfo.type === 'SAME' ||
convInfo.padInfo.type === 'VALID')) {\n  out = conv2dByMatMul({\n  x,\n  filter,\n  convInfo,\n
backend,\n  bias,\n  activation,\n  preluActivationWeights,\n  leakyreluAlpha\n  });\n } else if
(env().getBool('WEBGL_CONV_IM2COL') && x.shape[0] === 1) {\n  out = conv2dWithIm2Row({\n  x,\n
filter,\n  convInfo,\n  backend,\n  bias,\n  activation,\n  preluActivationWeights,\n  leakyreluAlpha\n
});\n } else {\n  const hasBias = bias != null;\n  const hasPreluActivationWeights = preluActivationWeights !=
null;\n  const hasLeakyreluAlpha = activation === 'leakyrelu';\n  const fusedActivation =\n  activation ?
mapActivationToShaderProgram(activation, false) : null;\n  const program = new Conv2DProgram(\n
convInfo, hasBias, fusedActivation, hasPreluActivationWeights,\n  hasLeakyreluAlpha);\n  const inputs:
TensorInfo[] = [x, filter];\n  if (bias) {\n  inputs.push(bias);\n  }\n  if (preluActivationWeights) {\n
inputs.push(preluActivationWeights);\n  }\n  if (hasLeakyreluAlpha) {\n  const $leakyreluAlpha =
backend.makeTensorInfo(\n  [], 'float32',\n  util.createScalarValue(leakyreluAlpha as {} as 'float32',
'float32'));\n  inputs.push($leakyreluAlpha);\n  intermediates.push($leakyreluAlpha);\n  }\n  out =
backend.runWebGLProgram(program, inputs, 'float32');\n }\n\n const outReshaped =\n  reshape({inputs: {x:
out}, backend, attrs: {shape: convInfo.outShape}});\n  intermediates.push(out);\n  intermediates.forEach(t =>
backend.disposeIntermediateTensorInfo(t));\n  return outReshaped;\n }\n\nexport const fusedConv2DConfig:
KernelConfig = {\n  kernelName: FusedConv2D,\n  backendName: 'webgl',\n  kernelFunc: fusedConv2d as {} as
KernelFunc,\n};\n\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {backend_util, env, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {DepthwiseConv2DProgram} from
'../conv_gpu_depthwise';\nimport {DepthwiseConvPacked2DProgram} from
'../conv_packed_gpu_depthwise';\nimport {mapActivationToShaderProgram} from
'../kernel_utils/kernel_funcs_utils';\n\nexport function fusedDepthwiseConv2D(args: {\n  inputs:
FusedDepthwiseConv2DInputs,\n  attrs: FusedDepthwiseConv2DAttrs,\n  backend: MathBackendWebGL\n}) {\n
const {inputs, backend, attrs} = args;\n  const {x, filter, bias, preluActivationWeights} = inputs;\n  const {strides,
pad, dilations, dimRoundingMode, activation, leakyreluAlpha} =\n  attrs;\n\n  const intermediates: TensorInfo[] =
[];\n\n  let $dilations = dilations;\n  if ($dilations == null) {\n  $dilations = [1, 1];\n  }\n\n  util.assert(\n
backend_util.eitherStridesOrDilationsAreOne(strides, $dilations),\n  () => 'Error in depthwiseConv2d: Either
strides or dilations must be ' +\n  `1. Got strides ${strides} and dilations '${dilations}'`);\n\n  const convInfo =
backend_util.computeConv2DInfo(\n  x.shape as [number, number, number, number],\n  filter.shape as
[number, number, number, number], strides, $dilations,\n  pad, dimRoundingMode, true /* depthwise */);\n\n  const shouldPackDepthwiseConv = env().getBool('WEBGL_PACK_DEPTHWISECONV') &&\n
convInfo.strideWidth <= 2 &&\n  convInfo.outChannels / convInfo.inChannels === 1;\n  const fusedActivation =
activation ?\n  mapActivationToShaderProgram(activation, shouldPackDepthwiseConv) :\n  null;\n  const
programInputs: TensorInfo[] = [x, filter];\n\n  const hasBias = bias != null;\n  const hasPreluActivationWeights =

```

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preluActivationWeights != null;\n const hasLeakyreluAlpha = activation === 'leakyrelu';\n\n if (hasBias) {\n
programInputs.push(bias);\n }\n if (hasPreluActivationWeights) {\n
programInputs.push(preluActivationWeights);\n }\n if (hasLeakyreluAlpha) {\n const $leakyreluAlpha =
backend.makeTensorInfo(\n [], 'float32',\n util.createScalarValue(leakyreluAlpha as {} as 'float32',
'float32'));\n programInputs.push($leakyreluAlpha);\n intermediates.push($leakyreluAlpha);\n }\n\n let
program: DepthwiseConv2DProgram|DepthwiseConvPacked2DProgram;\n if (shouldPackDepthwiseConv) {\n
program = new DepthwiseConvPacked2DProgram(\n convInfo, hasBias, fusedActivation,
hasPreluActivationWeights,\n hasLeakyreluAlpha);\n } else {\n program = new
DepthwiseConv2DProgram(\n convInfo, hasBias, fusedActivation, hasPreluActivationWeights,\n
hasLeakyreluAlpha);\n }\n\n const result = backend.runWebGLProgram(program, programInputs, 'float32');\n\n
intermediates.forEach(t => backend.disposeIntermediateTensorInfo(t));\n\n return result;\n}\n\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'webgl',\n kernelFunc: fusedDepthwiseConv2D as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'/shader_compiler';\n\nexport class GatherNDProgram implements GPGPUProgram {\n variableNames = ['x',
'indices'];\n outputShape: number[];\n userCode: string;\n constructor(\n private sliceDim: number, private
strides: number[], shape: number[]) {\n this.outputShape = shape;\n const stridesType =
getCoordsDataType(strides.length);\n const dtype = getCoordsDataType(shape.length);\n const strideString =
this.sliceDim > 1 ? 'strides[j] : 'strides';\n this.userCode = `\n ${stridesType} strides =
${stridesType}(${this.strides});\n void main() {\n ${dtype} coords = getOutputCoords();\n int
flattenIndex = 0;\n for (int j = 0; j < ${this.sliceDim}; j++) {\n int index = round(getIndices(coords[0],
j));\n flattenIndex += index * ${strideString};\n }\n setOutput(getX(flattenIndex, coords[1]));\n
}\n `;\n }\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*/\n\nimport {backend_util, GatherNd, GatherNdInputs, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {GatherNDProgram}
from './gather_nd_gpu';\nimport {reshape} from './Reshape';\n\nexport function gatherNd(\n args: {inputs:
GatherNdInputs, backend: MathBackendWebGL}): TensorInfo {\n const {inputs, backend} = args;\n const
{params, indices} = inputs;\n\n const indicesShape = indices.shape;\n const sliceRank =
indicesShape[indicesShape.length - 1];\n\n const [resultShape, numSlices, sliceSize, strides] =\n
backend_util.prepareAndValidate(params, indices);\n\n const flattenIndices = reshape(\n {inputs: {x: indices},
backend, attrs: {shape: [numSlices, sliceRank]}});\n\n const flattenX = reshape({\n inputs: {x: params},\n
backend,\n attrs: {shape: [(util.sizeFromShape(params.shape) / sliceSize), sliceSize]}\n });\n\n const program =\n new GatherNDProgram(sliceRank, strides, [numSlices, sliceSize]);\n const res = backend.runWebGLProgram(\n
program, [flattenX, flattenIndices], flattenX.dtype);\n\n const reshaped =\n reshape({inputs: {x: res}, backend,

```

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attrs: {shape: resultShape});\n\n backend.disposeIntermediateTensorInfo(flattenIndices);\n
backend.disposeIntermediateTensorInfo(flattenX);\n backend.disposeIntermediateTensorInfo(res);\n\n return
reshaped;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName:
'webgl',\n kernelFunc: gatherNd as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2017 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
 './shader_compiler';\n\nexport class GatherProgram implements GPGPUProgram {\n variableNames = ['A',
'indices'];\n outputShape: number[];\n userCode: string;\n rank: number;\n\n constructor(aShape: number[],
outputShape: number[]) {\n this.outputShape = outputShape;\n this.rank = outputShape.length;\n const dtype =
getCoordsDataType(this.rank);\n const sourceCoords = getSourceCoords(aShape, 2);\n\n this.userCode = `\n
void main() {\n    ${dtype} resRC = getOutputCoords();\n    setOutput(getA(${sourceCoords}));\n } \n `;\n
}\n}\n\n// The input and output are always flattened into rank 4 tensors.\nfunction getSourceCoords(aShape:
number[], axis: number): string {\n const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w'];\n\n const
sourceCoords = [];\n for (let i = 0; i < aShape.length; i++) {\n if (i === 2) {\n
sourceCoords.push('int(getIndices(resRC.x, resRC.z));'\n } else {\n
sourceCoords.push(`${currentCoords[i]}`);\n } }\n return sourceCoords.join();\n}\n", "/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, TensorInfo,
TypedArray, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from
 './backend_webgl';\nimport {GatherProgram} from './gather_gpu';\nimport {gatherV2ImplCPU} from
 './kernel_utils/shared';\n\nimport {reshape} from './Reshape';\n\nexport function gatherV2(args: {\n inputs:
GatherV2Inputs,\n backend: MathBackendWebGL,\n attrs: GatherV2Attrs\n}): TensorInfo {\n const {inputs,
backend, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n const parsedAxis =
util.parseAxisParam(axis, x.shape)[0];\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n
x, indices, parsedAxis, batchDims);\n\n const indicesSize = util.sizeFromShape(indices.shape);\n\n const
toDispose = [];\n\n const flattenX = reshape({\n inputs: {x},\n backend,\n attrs: {\n shape: [\n
shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n ]\n } });\n\n const
flattenIndex = reshape({\n inputs: {x: indices},\n backend,\n attrs: {shape: [shapeInfo.batchSize, indicesSize /
shapeInfo.batchSize]\n } });\n\n toDispose.push(flattenX);\n toDispose.push(flattenIndex);\n\n const
flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n
shapeInfo.sliceSize\n ];\n\n if (backend.shouldExecuteOnCPU([x, indices]) || x.dtype === 'string') {\n const
indicesBuf = backend.bufferSync(flattenIndex);\n const xBuf = backend.bufferSync(flattenX);\n const outBuf =
gatherV2ImplCPU(xBuf, indicesBuf, flattenOutputShape);\n\n toDispose.forEach(t =>\n
backend.disposeIntermediateTensorInfo(t));\n\n return backend.makeTensorInfo(\n shapeInfo.outputShape,
outBuf.dtype, outBuf.values as TypedArray);\n }\n\n const program = new GatherProgram(flattenX.shape,
flattenOutputShape);\n const res = backend.runWebGLProgram(\n program, [flattenX, flattenIndex],

```



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flattenX.dtype));\n toDispose.push(res);\n\n const reshaped = reshape(\n    {inputs: {x: res}, backend, attrs:
{shape: shapeInfo.outputShape}});\n toDispose.forEach(t=> backend.disposeIntermediateTensorInfo(t));\n return
reshaped);\n\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName:
'webgl',\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*\n\nimport {GreaterEqual, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc}
from './kernel_utils/kernel_funcs_utils';\n\nconst GREATER_EQUAL = `return float(a >= b);`;\nconst
GREATER_EQUAL_PACKED = `\n return vec4(greaterThanEqual(a, b));\n`;\n\nexport const greaterEqual =
binaryKernelFunc({\n opSnippet: GREATER_EQUAL,\n packedOpSnippet: GREATER_EQUAL_PACKED,\n
dtype: 'bool'\n});\n\nexport const greaterEqualConfig: KernelConfig = {\n kernelName: GreaterEqual,\n
backendName: 'webgl',\n kernelFunc: greaterEqual as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*\n\nimport {IFFT, IFFTInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from './backend_webgl';\nimport {fftImpl} from './FFT_impl';\n\nexport function
ifft(args: {inputs: IFFTInputs, backend: MathBackendWebGL}):\n TensorInfo {\n const {inputs, backend} =
args;\n const {input} = inputs;\n\n return fftImpl(input, true /* inverse */, backend);\n}\n\nexport const ifftConfig:
KernelConfig = {\n kernelName: IFFT,\n backendName: 'webgl',\n kernelFunc: ifft\n};\n\n", "/*\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {IsFinite, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst IS_FINITE = `return float(!isnan(x) && !isinf(x));`;\n\nexport const
isFinite = unaryKernelFunc({opSnippet: IS_FINITE, dtype: 'bool'});\n\nexport const isFiniteConfig: KernelConfig
= {\n kernelName: IsFinite,\n backendName: 'webgl',\n kernelFunc: isFinite\n};\n\n", "/*\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {IsInf, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from

```

```

'./kernel_utils/kernel_funcs_utils';\n\nconst IS_INF = `return float(isinf(x));`; \n\nexport const isInf =
unaryKernelFunc({ opSnippet: IS_INF, dtype: 'bool'}); \n\nexport const isInfConfig: KernelConfig = {\n
kernelName: IsInf,\n backendName: 'webgl',\n kernelFunc: isInf,\n}; \n\n"/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*\n\nimport {IsNan, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst IS_NAN = `return float(isnan(x));`; \n\nexport const isNaN =
unaryKernelFunc({ opSnippet: IS_NAN, dtype: 'bool'}); \n\nexport const isNaNConfig: KernelConfig = {\n
kernelName: IsNan,\n backendName: 'webgl',\n kernelFunc: isNaN,\n}; \n\n"/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*\n\nimport {KernelConfig, KernelFunc, LessEqual} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc}
from './kernel_utils/kernel_funcs_utils';\n\nexport const LESS_EQUAL = `return float(a <= b);`; \n\nexport const
LESS_EQUAL_PACKED = `\n return vec4(lessThanEqual(a, b));\n`; \n\nexport const lessEqual =
binaryKernelFunc(\n { opSnippet: LESS_EQUAL, packedOpSnippet: LESS_EQUAL_PACKED, dtype:
'bool'}); \n\nexport const lessEqualConfig: KernelConfig = {\n kernelName: LessEqual,\n backendName: 'webgl',\n
kernelFunc: lessEqual as {} as KernelFunc\n}; \n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*\n\nimport {KernelConfig, KernelFunc, LinSpace, LinSpaceAttrs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {linSpaceImplCPU} from
'./kernel_utils/shared';\n\nexport function linSpace(\n args: {backend: MathBackendWebGL, attrs:
LinSpaceAttrs}): TensorInfo {\n const {backend, attrs} = args;\n const {start, stop, num} = attrs;\n\n // TODO:
Use CPU implementation due to the precision problem in Safari.\n const outVals = linSpaceImplCPU(start, stop,
num);\n return backend.makeTensorInfo([outVals.length], 'float32', outVals);\n}\n\nexport const linSpaceConfig:
KernelConfig = {\n kernelName: LinSpace,\n backendName: 'webgl',\n kernelFunc: linSpace as {} as
KernelFunc\n}; \n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
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```

```

=====
*\n\nimport {KernelConfig, Log1p} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst LOG1P = `return log(1.0 + x);`;
\n\nexport const log1p =
unaryKernelFunc({opSnippet: LOG1P});\n\nexport const log1pConfig: KernelConfig = {\n  kernelName: Log1p,\n  backendName: 'webgl',\n  kernelFunc: log1p,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====
*\n\nimport {KernelConfig, KernelFunc, LogicalAnd} from '@tensorflow/tfjs-core';\nimport
{binaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_AND = `return float(a >= 1.0 &&
b >= 1.0);`;
\n\nconst LOGICAL_AND_PACKED = `\n  return vec4(\n    vec4(greaterThanEqual(a, vec4(1.0))) *\n    vec4(greaterThanEqual(b, vec4(1.0)))\n  );\n`;
\n\nexport const logicalAnd = binaryKernelFunc({\n  opSnippet:
LOGICAL_AND,\n  packedOpSnippet: LOGICAL_AND_PACKED,\n  dtype: 'bool'\n});\n\nexport const
logicalAndConfig: KernelConfig = {\n  kernelName: LogicalAnd,\n  backendName: 'webgl',\n  kernelFunc:
logicalAnd as {\n  } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====
*\n\nimport {KernelConfig, LogicalNot} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_NOT = `return float(!(x >= 1.0));`;
\n\nexport const
logicalNot = unaryKernelFunc({opSnippet: LOGICAL_NOT});\n\nexport const logicalNotConfig: KernelConfig =
{\n  kernelName: LogicalNot,\n  backendName: 'webgl',\n  kernelFunc: logicalNot,\n};\n", "/*\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, LogicalOr} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc}
from './kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_OR = `return float(a >= 1.0 || b >= 1.0);`;
\n\nconst
LOGICAL_OR_PACKED = `\n  return min(\n    vec4(greaterThanEqual(a, vec4(1.0))) +\n    vec4(greaterThanEqual(b, vec4(1.0))),\n    vec4(1.0)\n  );\n`;
\n\nexport const logicalOr = binaryKernelFunc(\n
  {opSnippet: LOGICAL_OR, packedOpSnippet: LOGICAL_OR_PACKED, dtype: 'bool'}\n);\n\nexport const
logicalOrConfig: KernelConfig = {\n  kernelName: LogicalOr,\n  backendName: 'webgl',\n  kernelFunc: logicalOr
as {\n  } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[] = [];\n  userCode: string;\n\n  constructor(\n    xShape: number[], radius: number, bias: number, alpha: number,\n    beta: number) {\n    const rad = radius;\n    const maxD = xShape[3] - 1;\n    this.outputShape = xShape;\n\n    // optimize pow(bias + alpha * sum, -beta)\n    // src: https://github.com/tensorflow/tensorflow/.. \n    // blob/26033a1644a9c4a5f3170ab2e864b6a4ccd4ca/.. \n    // tensorflow/core/kernels/mkl_lrn_op.cc#L320\n    let powOperator;\n    const basis = `float(${bias}) + float(${alpha}) * sum`;\n    if (beta === 0.5) {\n      powOperator = `inversesqrt(${basis})`;\n    } else if (beta === 1.0) {\n      powOperator = `1.0/(${basis})`;\n    } else {\n      powOperator = `exp(log(${basis}) * float(-${beta}))`;\n    }\n\n    this.userCode = `\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int b = coords[0];\n        int r = coords[1];\n        int c = coords[2];\n        int d = coords[3];\n        float x = getX(b, r, c, d);\n        float sum = 0.0;\n        for (int j = -${rad}; j <= ${rad}; j++) {\n          int idx = d + j;\n          if (idx >= 0 && idx <= ${maxD}) {\n            float z = getX(b, r, c, idx);\n            sum += z * z;\n          }\n          float val = x * ${powOperator};\n          setOutput(val);\n        }\n      }\n    `;\n  }\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC.\n * All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNPackedProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[] = [];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(\n    xShape: number[], radius: number, bias: number, alpha: number,\n    beta: number) {\n    const rad = radius;\n    const maxD = xShape[3] - 1;\n    this.outputShape = xShape;\n\n    // optimize pow(bias + alpha * sum, -beta)\n    // src: https://github.com/tensorflow/tensorflow/.. \n    // blob/26033a1644a9c4a5f3170ab2e864b6a4ccd4ca/.. \n    // tensorflow/core/kernels/mkl_lrn_op.cc#L320\n    let powOperator;\n    const basis = `float(${bias}) + float(${alpha}) * sum`;\n    if (beta === 0.5) {\n      powOperator = `inversesqrt(${basis})`;\n    } else if (beta === 1.0) {\n      powOperator = `1.0/(${basis})`;\n    } else {\n      powOperator = `exp(log(${basis}) * float(-${beta}))`;\n    }\n\n    this.userCode = `\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int b = coords.x;\n        int r = coords.y;\n        int c = coords.z;\n        int d = coords.w;\n\n        bool hasNextCol = d < ${this.outputShape[3]};\n        bool hasNextRow = c < ${this.outputShape[2]};\n\n        vec4 sum = vec4(0.);\n        vec4 xFragAtOutputCoords = getX(b, r, c, d);\n\n        vec4 xAtOutputCoords = vec4(\n          getChannel(xFragAtOutputCoords, vec2(c, d)),\n          hasNextCol ?\n            getChannel(xFragAtOutputCoords, vec2(c, d + 1)) : 0.0,\n          hasNextRow ?\n            getChannel(xFragAtOutputCoords, vec2(c + 1, d)) : 0.0,\n          hasNextRow && hasNextCol ?\n            getChannel(xFragAtOutputCoords, vec2(c + 1, d + 1)) : 0.0\n        );\n\n        int firstChannel = d - ${rad};\n        vec2 cache = vec2(0.);\n        if (firstChannel >= 0) {\n          vec4 firstChannelFrag = getX(b, r, c, firstChannel);\n          cache.x = getChannel(firstChannelFrag, vec2(c, firstChannel));\n          if (hasNextRow) {\n            cache.y = getChannel(firstChannelFrag, vec2(c + 1, firstChannel));\n          }\n        }\n\n        ivec2 depth = ivec2(d, d + 1);\n\n        for (int j = - ${rad}; j <= ${rad}; j++) {\n          ivec2 idx = depth + j;\n          bvec2 aboveLowerBound = greaterThanEqual(idx, ivec2(0));\n          bvec2 belowUpperBound = lessThanEqual(idx, ivec2(${maxD}));\n          bool depthInRange = aboveLowerBound.x && belowUpperBound.x;\n          bool depthPlusOneInRange = aboveLowerBound.y && belowUpperBound.y;\n          if (depthInRange || depthPlusOneInRange) {\n            vec4 z = vec4(0.);\n            vec4 xFragAtCurrentDepth;\n            z.xz = cache.xy;\n            if (depthPlusOneInRange && hasNextCol) {\n              xFragAtCurrentDepth = idx.y != d ?\n                getX(b, r, c, idx.y) :
```

```

xFragAtOutputCoords;\n          z.y = getChannel(xFragAtCurrentDepth, vec2(c, idx.y));\n
if(hasNextRow){\n          z.w = getChannel(xFragAtCurrentDepth, vec2(c + 1, idx.y));\n          }\n          }\n
cache.xy = z.yw;\n          sum += z * z;\n          }\n          }\n          vec4 result = xAtOutputCoords *
${powOperator};\n          setOutput(result);\n          }\n          `;\n          }\n          }",/**\n * @license\n * Copyright 2020 Google
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n
*/\n\nimport {env, KernelConfig, KernelFunc, LRN, LRNAttrs, LRNInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {LRNProgram} from
 '../lrn_gpu';\n\nimport {LRNPackedProgram} from '../lrn_packed_gpu';\n\nexport const lrn = (\n  args: {inputs:
LRNInputs, backend: MathBackendWebGL, attrs: LRNAttrs});\n  TensorInfo => {\n    const {inputs,
backend, attrs} = args;\n    const {x} = inputs;\n    const {depthRadius, bias, alpha, beta} = attrs;\n\n    const program = env().getBool('WEBGL_PACK_NORMALIZATION') ?\n      new
LRNPackedProgram(x.shape, depthRadius, bias, alpha, beta) : \n      new LRNProgram(x.shape, depthRadius,
bias, alpha, beta);\n    return backend.runWebGLProgram(program, [x], x.dtype);\n  };\n\n// tslint:disable-
next-line: variable-name\nexport const LRNConfig: KernelConfig = {\n  kernelName: LRN,\n  backendName:
'webgl',\n  kernelFunc: lrn as { } as KernelFunc\n};\n)",/**\n * @license\n * Copyright 2018 Google LLC. All
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n
*/\n\nimport {GPGPUProgram} from '../gpgpu_math';\n\nexport class LRNGradProgram implements
GPGPUProgram {\n  variableNames = ['inputImage', 'outputImage', 'dy'];\n  outputShape: number[] = [];\n  userCode: string;\n  depthRadius: number;\n  bias: number;\n  alpha: number;\n  beta: number;\n  depth: number;\n\n  constructor(\n    inputShape: number[], depthRadius: number, bias: number, alpha: number,\n    beta: number) {\n    this.outputShape = inputShape;\n    this.depth = inputShape[3];\n    this.depthRadius = depthRadius;\n    this.bias =
bias;\n    this.alpha = alpha;\n    this.beta = beta;\n    this.userCode = `
void main() {\n  ivec4 coords =
getOutputCoords();\n  int b = coords[0];\n  int r = coords[1];\n  int c = coords[2];\n\n  float result =
0.0;\n  for (int d = 0; d < ${this.depth}; ++d) {\n    int depthBegin = int(max(0.0, float(d -
${depthRadius}));\n    int depthEnd = int(min(float(${this.depth}),\n    float(d + ${depthRadius} +
1));\n\n    const int MIN_DEPTH_BEGIN = 0;\n    const int MAX_DEPTH_END = ${this.depth};\n\n    float norm = 0.0;\n    for (int k = MIN_DEPTH_BEGIN; k < MAX_DEPTH_END; ++k) {\n      if (k <
depthBegin) {\n        continue;\n      }\n      else if (k >= depthBegin && k < depthEnd) {\n        norm
+= getInputImage(b, r, c, k) * getInputImage(b, r, c, k);\n      }\n      else {\n        break;\n      }\n    }\n\n    norm = float(${alpha}) * norm + float(${bias});\n\n    for(int k = MIN_DEPTH_BEGIN; k <
MAX_DEPTH_END; ++k){\n      if (k < depthBegin){\n        continue;\n      }\n      else if (k >=
depthBegin && k < depthEnd){\n        float dyi = -2.0 * float(${alpha})\n        * float(${beta})\n\n        *
getInputImage(b, r, c, k) * getOutputImage(b, r, c, d)\n        / norm;\n        if (k == d) {\n          dyi +=
pow(norm, -1.0 * ${beta});\n        }\n        if (k == coords[3]) {\n          dyi *= getDy(b, r, c, d);\n          result += dyi;\n        }\n      }\n      else {\n        break;\n      }\n    }\n  }\n  setOutput(result);\n  }\n  `;\n  }\n  }\n)",/**\n * @license\n * Copyright 2020 Google LLC. All Rights

```

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, LRNGrad, LRNGradAttrs, LRNGradInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { LRNGradProgram } from '../lrn_grad_gpu';\n\nexport const lrnGrad = (args: {\n  inputs: LRNGradInputs,\n  backend: MathBackendWebGL,\n  attrs: LRNGradAttrs\n}): TensorInfo => {\n  const { inputs, backend, attrs } = args;\n  const [x, y, dy] = inputs;\n  const { depthRadius, bias, alpha, beta } = attrs;\n  const program = new LRNGradProgram(x.shape, depthRadius, bias, alpha, beta);\n  return backend.runWebGLProgram(program, [x, y, dy], x.dtype);\n};\n\n// tslint:disable-next-line: variable-name\nexport const LRNGradConfig: KernelConfig = {\n  kernelName: LRNGrad,\n  backendName: 'webgl',\n  kernelFunc: lrnGrad as {} as KernelFunc\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport { KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { backend_util, KernelConfig, TypedArray, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { maxImplCPU } from '../kernel_utils/shared';\nimport { maxImpl } from './Max_impl';\nimport { transposeImpl, transposeImplCPU } from './Transpose_impl';\n\nexport function max(\n  args: {\n    inputs: MaxInputs,\n    backend: MathBackendWebGL,\n    attrs: MaxAttrs\n  }): TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const [x] = inputs;\n  const { reductionIndices, keepDims } = attrs;\n  const xRank = x.shape.length;\n  const origAxes = util.parseAxisParam(reductionIndices, x.shape);\n  let axes = origAxes;\n  const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  const maxInputIsTransposed = permutedAxes !== null;\n  const shouldExecuteOnCPU = backend.shouldExecuteOnCPU([x]);\n  let maxInput = x;\n  if (maxInputIsTransposed) {\n    if (shouldExecuteOnCPU) {\n      const xTexData = backend.texData.get(maxInput.dataId);\n      const values = xTexData.values as TypedArray;\n      const newShape: number[] = new Array(xRank);\n      for (let i = 0; i < newShape.length; i++) {\n        newShape[i] = x.shape[permutedAxes[i]];\n      }\n      const maxInputValues =\n        transposeImplCPU(values, x.shape, x.dtype, permutedAxes, newShape);\n      maxInput = backend.makeTensorInfo(newShape, x.dtype);\n      const maxInputData = backend.texData.get(maxInput.dataId);\n      maxInputData.values = maxInputValues;\n    } else {\n      maxInput = transposeImpl(x, permutedAxes, backend);\n    }\n  }\n  axes = backend_util.getInnerMostAxes(axes.length, xRank);\n  backend_util.assertAxesAreInnerMostDims('max', axes, xRank);\n  const [maxOutShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(maxInput.shape, axes);\n  let outShape = maxOutShape;\n  if (keepDims) {\n    // rather than reshape at the end, set the target shape here.\n    outShape = backend_util.expandShapeToKeepDim(maxOutShape, origAxes);\n  }\n  let out;\n  if (shouldExecuteOnCPU) {\n    const xTexData = backend.texData.get(maxInput.dataId);\n    const values = xTexData.values as TypedArray;\n    const outValues =\n      maxImplCPU(values, util.sizeFromShape(reduceShape), outShape, x.dtype);\n    out = backend.makeTensorInfo(outShape, x.dtype);\n    const outData = backend.texData.get(out.dataId);\n    outData.values = outValues;\n  } else {\n    out = maxImpl(maxInput, reduceShape, outShape, backend);\n  }\n  if (maxInputIsTransposed) {\n    backend.disposeIntermediateTensorInfo(maxInput);\n  }\n  return out;\n}\n\nexport
```

const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'webgl',\n kernelFunc: max as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Pool2DProgram} from '../pool_gpu';\nimport {assertNotComplex} from '../webgl_util';\nimport {identity} from './Identity';\nexport function maxPool(args: {\n inputs: MaxPoolInputs,\n backend: MathBackendWebGL,\n attrs: MaxPoolAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n assertNotComplex(x, 'maxPool');\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const dilations = 1;\n\n util.assert(\n backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n () => 'Error in maxPool: Either strides or dilations must be 1. ' +\n `Got strides ${strides} and dilations '${dilations}'`);\n\n const convInfo = backend_util.computePool2DInfo(\n x.shape as [number, number, number, number], filterSize, strides,\n dilations, pad, dimRoundingMode);\n if (convInfo.filterWidth === 1 && convInfo.filterHeight === 1 &&\n util.arraysEqual(convInfo.inShape, convInfo.outShape)) {\n return identity({inputs: {x}, backend});\n }\n const maxPoolProgram = new Pool2DProgram(convInfo, 'max', false);\n return backend.runWebGLProgram(maxPoolProgram, [x], x.dtype);\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'webgl',\n kernelFunc: maxPool as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {backend_util, KernelConfig, KernelFunc, MaxPool3D, MaxPool3DAttrs, MaxPool3DInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Pool3DProgram} from '../pool_gpu';\nexport function maxPool3d(args: {\n inputs: MaxPool3DInputs,\n backend: MathBackendWebGL,\n attrs: MaxPool3DAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {filterSize, strides, pad, dataFormat, dimRoundingMode} = attrs;\n const dilations: [number, number, number] = [1, 1, 1];\n\n const convInfo = backend_util.computePool3DInfo(\n x.shape as [number, number, number, number, number], filterSize, strides,\n dilations, pad, dimRoundingMode, dataFormat);\n const maxPoolProgram = new Pool3DProgram(convInfo, 'max', false);\n return backend.runWebGLProgram(maxPoolProgram, [x], x.dtype);\n}\n\nexport const maxPool3DConfig: KernelConfig = {\n kernelName: MaxPool3D,\n backendName: 'webgl',\n kernelFunc: maxPool3d as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gggpu_math';\n\nexport class MaxPool2DBackpropProgram implements GPGPUProgram {\n  variableNames =
['dy', 'maxPos'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo:
backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.inShape;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationHeight =
convInfo.dilationHeight;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n    const padTop = effectiveFilterHeight - 1 -
convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const lastIndex =
effectiveFilterHeight * effectiveFilterWidth - 1;\n    this.userCode = `\n    const ivec2 pads = ivec2(${padTop},
${padLeft});\n\n    void main() {\n      ivec4 coords = getOutputCoords();\n      int b = coords[0];\n      int d =
coords[3];\n\n      ivec2 dyRCCorner = coords.yz - pads;\n      int dyRCorner = dyRCCorner.x;\n      int
dyCCorner = dyRCCorner.y;\n\n      // Convolve dy(?, ?, d) with pos mask(:, :, d) to get dx(xR, xC, d).\n      // ? =
to be determined. := across all values in that axis.\n      float dotProd = 0.0;\n      for (int wR = 0; wR <
${effectiveFilterHeight};\n        wR += ${dilationHeight}) {\n        float dyR = float(dyRCorner + wR) /
${strideHeight}.0;\n\n        if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 || fract(dyR) > 0.0) {\n
continue;\n        }\n        int idyR = int(dyR);\n\n        for (int wC = 0; wC < ${effectiveFilterWidth}; wC++) {\n
float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n        if (dyC < 0.0 || dyC >=
${convInfo.outWidth}.0 ||\n          fract(dyC) > 0.0) {\n          continue;\n        }\n        int idyC =
int(dyC);\n\n        float dyValue = getDy(b, idyR, idyC, d);\n        int maxPosValue = ${lastIndex} -
int(getMaxPos(b, idyR, idyC, d));\n\n        // Get the current value, check it against the value from the\n        //
position matrix.\n        int curPosValue = wR * ${effectiveFilterWidth} + wC;\n        float mask =
float(maxPosValue == curPosValue ? 1.0 : 0.0);\n        dotProd += dyValue * mask;\n      }\n    }\n  }\n  setOutput(dotProd);\n  }\n  `;\n}\n\nexport class MaxPool3DBackpropProgram implements
GPGPUProgram {\n  variableNames = ['dy', 'maxPos'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape = convInfo.inShape;\n    const strideDepth =
convInfo.strideDepth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const dilationDepth = convInfo.dilationDepth;\n    const dilationHeight =
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const effectiveFilterDepth =
convInfo.effectiveFilterDepth;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n    const padFront = effectiveFilterDepth - 1 -
convInfo.padInfo.front;\n    const padTop = effectiveFilterHeight - 1 - convInfo.padInfo.top;\n    const padLeft =
effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const lastIndex =\n      effectiveFilterDepth *
effectiveFilterHeight * effectiveFilterWidth - 1;\n    this.userCode = `\n    const ivec3 pads = ivec3(${padFront},
${padTop}, ${padLeft});\n\n    void main() {\n      ivec5 coords = getOutputCoords();\n      int batch =
coords.x;\n      int ch = coords.u;\n\n      ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w) - pads;\n      int
dyDCorner = dyCorner.x;\n      int dyRCorner = dyCorner.y;\n      int dyCCorner = dyCorner.z;\n\n      //
Convolve dy(?, ?, ?, ch) with pos mask(:, :, :, d) to get\n      // dx(xD, xR, xC, ch).\n      // ? = to be determined. :=
across all values in that axis.\n      float dotProd = 0.0;\n\n      for (int wD = 0; wD < ${effectiveFilterDepth};\n        wD += ${dilationDepth}) {\n        float dyD = float(dyDCorner + wD) / ${strideDepth}.0;\n\n        if (dyD <
0.0 || dyD >= ${convInfo.outDepth}.0 || fract(dyD) > 0.0) {\n          continue;\n        }\n        int idyD =
int(dyD);\n\n        for (int wR = 0; wR < ${effectiveFilterHeight};\n          wR += ${dilationHeight}) {\n
float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n          if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0
||\n            fract(dyR) > 0.0) {\n            continue;\n          }\n          int idyR = int(dyR);\n\n          for (int wC =
0; wC < ${effectiveFilterWidth};\n            wC += ${dilationWidth}) {\n            float dyC = float(dyCCorner +
wC) / ${strideWidth}.0;\n\n            if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n              fract(dyC) > 0.0)
{\n              continue;\n            }\n            int idyC = int(dyC);\n\n            float dyValue = getDy(batch, idyD,
idyR, idyC, ch);\n            int maxPosValue = ${lastIndex} -\n              int(getMaxPos(batch, idyD, idyR, idyC,
ch));\n\n            // Get the current value, check it against the value from the\n            // position matrix.\n

```



```

int curPosValue =\n          wD * ${effectiveFilterHeight} * ${effectiveFilterWidth} +\n          wR *
${effectiveFilterWidth} + wC;\n          float mask = float(maxPosValue == curPosValue ? 1.0 : 0.0);\n
dotProd += dyValue * mask;\n          }\n          }\n          setOutput(dotProd);\n          `;\n          }\n          }"/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPool3DGrad, MaxPool3DGradAttrs,
MaxPool3DGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from
'./backend_webgl';\nimport {MaxPool3DBackpropProgram} from './max_pool_backprop_gpu';\nimport
{Pool3DProgram} from './pool_gpu';\n\nexport function maxPool3DGrad(args: {\n inputs:
MaxPool3DGradInputs,\n backend: MathBackendWebGL,\n attrs: MaxPool3DGradAttrs\n}): TensorInfo {\n
const {inputs, backend, attrs} = args;\n const {dy, input} = inputs;\n const x = input;\n const {filterSize, strides,
pad, dimRoundingMode} = attrs;\n const dilations: [number, number, number] = [1, 1, 1];\n\n const convInfo =
backend_util.computePool3DInfo(\n x.shape as [number, number, number, number, number], filterSize, strides,\n
dilations, pad, dimRoundingMode);\n\n const maxPool3dPositionsProgram =\n new
Pool3DProgram(convInfo, 'max', true /* get positions */);\n const maxPool3dPositions =\n
backend.runWebGLProgram(maxPool3dPositionsProgram, [x], x.dtype);\n const maxPoolBackpropProgram = new
MaxPool3DBackpropProgram(convInfo);\n const result = backend.runWebGLProgram(\n
maxPoolBackpropProgram, [dy, maxPool3dPositions], x.dtype);\n
backend.disposeIntermediateTensorInfo(maxPool3dPositions);\n return result;\n}\n\nexport const
maxPoolGrad3DConfig: KernelConfig = {\n kernelName: MaxPool3DGrad,\n backendName: 'webgl',\n
kernelFunc: maxPool3DGrad as {} as KernelFunc\n};\n"/*\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPoolGrad, MaxPoolGradAttrs, MaxPoolGradInputs,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport
{MaxPool2DBackpropProgram} from './max_pool_backprop_gpu';\nimport {Pool2DProgram} from
'./pool_gpu';\nimport {assertNotComplex} from './webgl_util';\n\nexport function maxPoolGrad(args: {\n inputs:
MaxPoolGradInputs,\n backend: MathBackendWebGL,\n attrs: MaxPoolGradAttrs\n}): TensorInfo {\n
const {inputs, backend, attrs} = args;\n const {dy, input, output} = inputs;\n const x = input;\n
assertNotComplex([input, output], 'maxPoolGrad');\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n
const convInfo = backend_util.computePool2DInfo(\n x.shape as [number, number, number, number], filterSize,
strides,\n 1 /*
dilations */,\n pad, dimRoundingMode);\n const getPositions = true;\n const maxPoolPositionsProgram =\n new
Pool2DProgram(convInfo, 'max', getPositions);\n const maxPoolPositions: TensorInfo =\n
backend.runWebGLProgram(maxPoolPositionsProgram, [x], x.dtype);\n\n const maxPoolBackPropProgram = new
MaxPool2DBackpropProgram(convInfo);\n const result = backend.runWebGLProgram(\n
maxPoolBackPropProgram, [dy, maxPoolPositions], x.dtype);\n
backend.disposeIntermediateTensorInfo(maxPoolPositions);\n return result;\n}\n\nexport const
maxPoolGradConfig: KernelConfig = {\n kernelName: MaxPoolGrad,\n backendName: 'webgl',\n kernelFunc:

```

maxPoolGrad as { } as KernelFunc\n);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, TensorInfo } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { Pool2DProgram } from './pool_gpu';\nexport function maxPoolWithArgmaxImpl(\n  x: TensorInfo, includeBatchInIndex: boolean,\n  convInfo: backend_util.Conv2DInfo,\n  backend: MathBackendWebGL): TensorInfo[] {\n  let program = new Pool2DProgram(convInfo, 'max', false);\n  const poolOutput = backend.runWebGLProgram(program, [x], 'float32');\n  program = new Pool2DProgram(convInfo, 'max', true, true, includeBatchInIndex);\n  const indexOutput = backend.runWebGLProgram(program, [x], 'float32');\n  return [poolOutput, indexOutput];\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport { MaxPoolWithArgmax, MaxPoolWithArgmaxAttrs, MaxPoolWithArgmaxInputs } from '@tensorflow/tfjs-core';\nimport { backend_util, KernelConfig, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { maxPoolWithArgmaxImpl } from './MaxPoolWithArgmax_impl';\nexport const maxPoolWithArgmaxConfig: KernelConfig = {\n  kernelName: MaxPoolWithArgmax,\n  backendName: 'webgl',\n  kernelFunc: ((inputs, attrs, backend) => {\n    const { x } = inputs as MaxPoolWithArgmaxInputs;\n    const { filterSize, strides, pad, includeBatchInIndex } =\n      attrs as {\n        as MaxPoolWithArgmaxAttrs;\n        const webglBackend = backend as MathBackendWebGL;\n        util.assert(\n          x.shape.length === 4,\n          () => `Error in maxPool: input must be rank 4 but got rank ${\n            x.shape.length\n          }`);\n        const dilations: [number, number] = [1, 1];\n        util.assert(\n          backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n          () => `Error in maxPool: Either strides or dilations must be 1. ` +\n            `Got strides ${strides} and dilations ${dilations}`);\n        const convInfo =\n          backend_util.computePool2DInfo(\n            x.shape as [number, number, number, number], filterSize, strides,\n            dilations, pad);\n        const [result, indexes] =\n          maxPoolWithArgmaxImpl(x, includeBatchInIndex, convInfo,\n            webglBackend);\n        return [result, indexes];\n      });\n  }, "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { reduce } from './kernel_utils/reduce';\nimport { reshape } from './kernels/Reshape';\nexport function meanImpl(\n  x: TensorInfo, reduceShape: number[], outShape: number[],\n  backend: MathBackendWebGL): TensorInfo {\n  const inSize = util.sizeFromShape(reduceShape);\n  const xSize = util.sizeFromShape(x.shape);\n  const batchSize = xSize / inSize;\n  const reshapedInput =\n
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reshape({inputs: {x}, attrs: {shape: [batchSize, inSize]}, backend});\n\n const reduced = reduce(reshapedInput,
'float32', 'mean', backend);\n const reshapedOutput =\n  reshape({inputs: {x: reduced}, attrs: {shape: outShape},
backend});\n\n backend.disposeIntermediateTensorInfo(reshapedInput);\n
backend.disposeIntermediateTensorInfo(reduced);\n\n return reshapedOutput;\n}\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {backend_util, KernelConfig, Mean, MeanAttrs, MeanInputs, TensorInfo, TypedArray, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {meanImpl} from
'./Mean_impl';\n\nimport {transposeImpl, transposeImplCPU} from './Transpose_impl';\n\nexport const meanConfig:
KernelConfig = {\n  kernelName: Mean,\n  backendName: 'webgl',\n  kernelFunc: ({inputs, attrs, backend}) => {\n
const {x} = inputs as MeanInputs;\n  const {keepDims, axis} = attrs as {} as MeanAttrs;\n  const webglBackend
= backend as MathBackendWebGL;\n\n  const xRank = x.shape.length;\n  const origAxes =
util.parseAxisParam(axis, x.shape);\n\n  let axes = origAxes;\n  const permutedAxes =
backend_util.getAxesPermutation(axes, xRank);\n  const meanInputIsTransposed = permutedAxes != null;\n\n
const shouldExecuteOnCPU = webglBackend.shouldExecuteOnCPU([x]);\n  const intermediates: TensorInfo[] =
[];\n\n  let meanInput = x;\n  if (meanInputIsTransposed) {\n    if (shouldExecuteOnCPU) {\n      const
xTexData = webglBackend.texData.get(meanInput.dataId);\n      const values = xTexData.values as
TypedArray;\n\n      const newShape: number[] = new Array(xRank);\n      for (let i = 0; i < newShape.length;
i++) {\n        newShape[i] = x.shape[permutedAxes[i]];\n      }\n      const meanInputValues =\n
transposeImplCPU(values, x.shape, x.dtype, permutedAxes, newShape);\n\n      meanInput =
webglBackend.makeTensorInfo(newShape, x.dtype);\n      const meanInputData =
webglBackend.texData.get(meanInput.dataId);\n      meanInputData.values = meanInputValues;\n    } else {\n
meanInput = transposeImpl(x, permutedAxes, webglBackend);\n    }\n\n    intermediates.push(meanInput);\n\n
axes = backend_util.getInnerMostAxes(axes.length, xRank);\n  }\n\n  backend_util.assertAxesAreInnerMostDims('sum', axes, xRank);\n  const [meanOutShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(meanInput.shape, axes);\n\n  let outShape = meanOutShape;\n  if
(keepDims) {\n    // rather than reshape at the end, set the target shape here.\n    outShape =
backend_util.expandShapeToKeepDim(meanOutShape, origAxes);\n  }\n\n  const out = meanImpl(meanInput,
reduceShape, outShape, webglBackend);\n  for (const i of intermediates) {\n
webglBackend.disposeIntermediateTensorInfo(i);\n  }\n\n  return out;\n}\n};\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {reduce} from
'./kernel_utils/reduce';\n\nimport {reshape} from './Reshape';\n\nimport {transpose} from './Transpose';\n\nexport
function min(\n  args: {inputs: MinInputs, backend: MathBackendWebGL, attrs: MinAttrs};\n) TensorInfo {\n
const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis, keepDims} = attrs;\n\n  const xRank =
x.shape.length;\n\n  const origAxes = util.parseAxisParam(axis, x.shape);\n  let axes = origAxes;\n  const

```



```

int source = rc;\n * if (source < start) {\n * source = start * 2 - source - 0;\n * } else if (source >= end)
{\n * source = (end - 1) * 2 - source + 0;\n * }\n * source -= start;\n * \n * result[0] =
getChannel(getX(source), source);\n * rc += 1;\n * if(rc < 6) {\n * int source = rc;\n * if (source <
start) {\n * source = start * 2 - source - 0;\n * } else if (source >= end) {\n * source = (end - 1) *
2 - source + 0;\n * }\n * source -= start;\n * \n * result[1] = getChannel(getX(source), source);\n *
}\n * \n * setOutput(result);\n * }\n *
```\n *^\nexport class MirrorPadPackedProgram implements
GPGPUProgram {\n variableNames = ['x'];\n packedInputs = true;\n packedOutput = true;\n outputShape:
number[];\n userCode: string;\n\n constructor(\n xShape: number[], paddings: Array<[number, number]>,\n
mode: 'reflect'|'symmetric') {\n this.outputShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + xShape[i]
+ p[1] /* afterPad */);\n const rank = xShape.length;\n const dtype = getCoordsDataType(rank);\n\n const start
= paddings.map(p => p[0]).join(',');\n const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n const
coords = getChannels('rc', rank);\n const source = getChannels('source', rank);\n const cLimit = `${coords[rank -
1]} < ${this.outputShape[rank - 1]}`;\n const innerDims =\n rank === 1 ? 'source': `vec2(${source.slice(-
2).join()})`;\n const offset = mode === 'reflect' ? 0 : 1;\n let mainLoop = `;\n if (rank === 1) {\n const
padSetup = `\n ${dtype} source = rc;\n if (source < start) {\n source = start * 2 - source - ${offset};\n
} else if (source >= end) {\n source = (end - 1) * 2 - source + ${offset};\n }\n source -= start;\n
`;\n mainLoop = `\n ${dtype} rc = outputLoc;\n ${padSetup}\n result[0] =
getChannel(getX(${source.join()}), ${innerDims});\n ${coords[rank - 1]} += 1;\n if(${cLimit}) {\n
${padSetup}\n result[1] = getChannel(getX(${source.join()}), ${innerDims});\n }\n `;\n } else {\n
const padSetup = `\n ${dtype} source = rc;\n ${dtype} lt = ${dtype}(lessThan(source, start));\n
${dtype} gte = ${dtype}(greaterThanEqual(source, end));\n ${dtype} orig = 1 - (lt + gte);\n source = orig *
source +\n lt * (start * 2 - source - ${offset}) +\n gte * ((end - 1) * 2 - source + ${offset});\n
source -= start;\n `;\n\n mainLoop = `\n ${dtype} rc = outputLoc;\n ${padSetup}\n result[0] =
getChannel(getX(${source.join()}), ${innerDims});\n ${coords[rank - 1]} += 1;\n if(${cLimit}) {\n
${padSetup}\n result[1] = getChannel(getX(${source.join()}), ${innerDims});\n }\n rc = outputLoc;\n
${coords[rank - 2]} += 1;\n if(${coords[rank - 2]} < ${this.outputShape[rank - 2]}) {\n ${padSetup}\n
result[2] = getChannel(getX(${source.join()}), ${innerDims});\n ${coords[rank - 1]} += 1;\n
if(${cLimit}) {\n ${padSetup}\n result[3] = getChannel(getX(${source.join()}), ${innerDims});\n
}\n }\n `;\n }\n\n this.userCode = `\n const ${dtype} start = ${dtype}(${start});\n const ${dtype}
end = ${dtype}(${end});\n\n void main() {\n ${dtype} outputLoc = getOutputCoords();\n vec4 result =
vec4(0);\n ${mainLoop}\n setOutput(result);\n }\n `;\n }\n }\n\n`"/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
`
=====
*\n\nimport {env, KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs, TensorInfo} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport {MirrorPadProgram}
from './mirror_pad_gpu';\n\nimport {MirrorPadPackedProgram} from './mirror_pad_packed_gpu';\n\nexport const
mirrorPadKernelFunc: (params: {\n inputs: MirrorPadInputs,\n backend: MathBackendWebGL,\n attrs:
MirrorPadAttrs\n}) => TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {paddings,
mode} = attrs;\n\n const program = env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n new
MirrorPadPackedProgram(x.shape, paddings, mode) :\n new MirrorPadProgram(x.shape, paddings, mode);\n\n const output = backend.runWebGLProgram(program, [x], x.dtype);\n\n return output;\n};\n\nexport const
mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'webgl',\n kernelFunc:
mirrorPadKernelFunc as {} as KernelFunc,\n};\n\n`"/**\n * @license\n * Copyright 2020 Google LLC. All Rights

```

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```
=====\n*\n\nimport {KernelConfig, KernelFunc, Mod} from '@tensorflow/tfjs-core';\nimport\n{CHECK_NAN_SNIPPET} from './binaryop_packed_gpu';\nimport {binaryKernelFunc} from\n './kernel_utils/kernel_funcs_utils';\nconst MOD = `if (b == 0.0) return NAN;\n return mod(a, b);`\nconst\nMOD_PACKED = `\n vec4 result = mod(a, b);\n vec4 isNaN = vec4(equal(b, vec4(0.0)));`\n `+\nCHECK_NAN_SNIPPET + `\n return result;`\n\nexport const mod = binaryKernelFunc({\n opSnippet: MOD,\n packedOpSnippet: MOD_PACKED,\n});\n\nexport const modConfig: KernelConfig = {\n kernelName: Mod,\n backendName: 'webgl',\n kernelFunc: mod as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2017\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport\nclass MultinomialProgram implements GPGPUProgram {\n variableNames = ['probs'];\n outputShape: number[];\n userCode: string;\n\n // Caching uniform location for speed.\n seedLoc: WebGLUniformLocation;\n\n constructor(batchSize: number, numOutcomes: number, numSamples: number) {\n this.outputShape = [batchSize,\n numSamples];\n\n this.userCode = `\n uniform float seed;\n void main() {\n ivec2 coords =\n getOutputCoords();\n int batch = coords[0];\n float r = random(seed);\n float cdf = 0.0;\n\n for\n (int i = 0; i < ${numOutcomes - 1}; i++) {\n cdf += getProbs(batch, i);\n\n if (r < cdf) {\n\n setOutput(float(i));\n return;\n }\n }\n\n // If no other event happened, last event happened.\n setOutput(float(${numOutcomes - 1}));\n }\n `;\n\n getCustomSetupFunc(seed: number) {\n return\n (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n if (this.seedLoc == null) {\n this.seedLoc = gpgpu.getUniformLocation(webGLProgram, 'seed');\n }\n gpgpu.gl.uniform1f(this.seedLoc,\n seed);\n }\n }\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
```

```
=====\n*\n\nimport {RealDiv} from '@tensorflow/tfjs-core';\nimport {KernelConfig} from '@tensorflow/tfjs-\ncore';\nimport {binaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\n// Without the equality check div\nproduces 0.9999 for a = b, which when\n// floored can cause errors.\nconst DIV = `\nif (a == b) {\n return\n 1.0;\n};\n\nreturn a / b;`\n\n// We do the same as in ./binaryop_gpu, with vec4 and ivec4.\n// On Linux, the vectorized\nimplementation produces NaNs when a and b are 0.\nconst DIV_PACKED = `\n // vec4 one = vec4(equal(a, b));\n // return one + (vec4(1.0) - one) * a / b;\n vec4 result = a / b;\n if(a.x == b.x) {\n result.x = 1.;\n }\n if(a.y ==\n b.y) {\n result.y = 1.;\n }\n if(a.z == b.z) {\n result.z = 1.;\n }\n if(a.w == b.w) {\n result.w = 1.;\n }\n\n return result;\n `;\n\nexport const realDiv = binaryKernelFunc(\n {\n opSnippet: DIV, packedOpSnippet:
```

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DIV_PACKED, checkOutOfBounds: true});\n\nexport const realDivConfig: KernelConfig = {\n kernelName: RealDiv,\n backendName: 'webgl',\n kernelFunc: realDiv,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { exp } from './Exp';\nimport { max } from './Max';\nimport { realDiv } from './RealDiv';\nimport { reshape } from './Reshape';\nimport { sub } from './Sub';\nimport { sum } from './Sum';\n\nexport function softmax(args: {\n inputs: SoftmaxInputs,\n backend: MathBackendWebGL,\n attrs: SoftmaxAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {logits} = inputs;\n const {dim} = attrs;\n\n const axes = util.parseAxisParam([dim], logits.shape);\n\n const maxLogit = max({\n inputs: {x: logits},\n backend,\n attrs: {reductionIndices: axes, keepDims: false}\n });\n const expandedShape = backend_util.expandShapeToKeepDim(maxLogit.shape, axes);\n const maxLogitsReshaped = reshape({\n inputs: {x: maxLogit},\n backend, attrs: {shape: expandedShape}\n });\n const a = sub({\n inputs: {a: logits, b: maxLogitsReshaped},\n backend\n }) as TensorInfo;\n const b = exp({\n inputs: {x: a},\n backend\n }) as TensorInfo;\n const sumExp = sum({\n inputs: {x: b},\n backend, attrs: {axis: axes, keepDims: false}\n });\n const sumExpReshaped = reshape({\n inputs: {x: sumExp},\n backend, attrs: {shape: expandedShape}\n });\n const res = realDiv({\n inputs: {a: b, b: sumExpReshaped},\n backend\n }) as TensorInfo;\n backend.disposeIntermediateTensorInfo(maxLogit);\n backend.disposeIntermediateTensorInfo(maxLogitsReshaped);\n backend.disposeIntermediateTensorInfo(a);\n backend.disposeIntermediateTensorInfo(b);\n backend.disposeIntermediateTensorInfo(sumExp);\n backend.disposeIntermediateTensorInfo(sumExpReshaped);\n return res;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'webgl',\n kernelFunc: softmax as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Multinomial, MultinomialAttrs, MultinomialInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { MultinomialProgram } from '../multinomial_gpu';\nimport { softmax } from './Softmax';\n\nexport function multinomial(args: {\n inputs: MultinomialInputs,\n backend: MathBackendWebGL,\n attrs: MultinomialAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {logits} = inputs;\n const {numSamples, seed, normalized} = attrs;\n\n const probs = normalized ? logits : softmax({\n inputs: {logits},\n backend, attrs: {dim: logits.shape.length - 1}\n });\n const batchSize = probs.shape[0];\n const numOutcomes = probs.shape[1];\n const program = new MultinomialProgram(batchSize, numOutcomes, numSamples);\n const customSetup = program.getCustomSetupFunc(seed);\n const res = backend.runWebGLProgram(program, [probs], 'int32', customSetup);\n if (!normalized) {\n backend.disposeIntermediateTensorInfo(probs);\n }\n return res;\n}\n\nexport const multinomialConfig: KernelConfig = {\n kernelName: Multinomial,\n backendName: 'webgl',\n kernelFunc: multinomial as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC.
```

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```
=====\n*\n\nimport { backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TypedArray } from '@tensorflow/tfjs-core';\nconst nonMaxSuppressionV3Impl = kernel_impls.nonMaxSuppressionV3Impl;\nimport { MathBackendWebGL } from './backend_webgl';\nexport function nonMaxSuppressionV3(args: { \n inputs: NonMaxSuppressionV3Inputs,\n backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV3Attrs\n}) { \n backend_util.warn(\n 'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n 'Call tf.nonMaxSuppressionAsync() instead');\n\n const { inputs, backend, attrs } = args;\n const { boxes, scores } = inputs;\n const { maxOutputSize, iouThreshold, scoreThreshold } = attrs;\n\n const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n const { selectedIndices } = nonMaxSuppressionV3Impl(\n boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold);\n\n return backend.makeTensorInfo(\n [selectedIndices.length], 'int32', new Int32Array(selectedIndices));\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = { \n kernelName: NonMaxSuppressionV3,\n backendName: 'webgl',\n kernelFunc: nonMaxSuppressionV3 as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport { backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo, TypedArray } from '@tensorflow/tfjs-core';\nconst nonMaxSuppressionV4Impl = kernel_impls.nonMaxSuppressionV4Impl;\nimport { MathBackendWebGL } from './backend_webgl';\nexport function nonMaxSuppressionV4(args: { \n inputs: NonMaxSuppressionV4Inputs,\n backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV4Attrs\n}): [TensorInfo, TensorInfo] { \n backend_util.warn(\n 'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n 'Call tf.nonMaxSuppressionAsync() instead');\n\n const { inputs, backend, attrs } = args;\n const { boxes, scores } = inputs;\n const { maxOutputSize, iouThreshold, scoreThreshold, padToMaxOutputSize } =\n attrs;\n\n const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n const { selectedIndices, validOutputs } = nonMaxSuppressionV4Impl(\n boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n return [\n backend.makeTensorInfo(\n [selectedIndices.length], 'int32', new Int32Array(selectedIndices)),\n backend.makeTensorInfo([\n validOutputs\n], 'int32', new Int32Array([validOutputs]))\n];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = { \n kernelName: NonMaxSuppressionV4,\n backendName: 'webgl',\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
```



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```
=====\n*\n\nimport {backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nconst nonMaxSuppressionV5Impl = kernel_impls.nonMaxSuppressionV5Impl;\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nexport function nonMaxSuppressionV5(args: {\n inputs: NonMaxSuppressionV5Inputs,\n backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV5Attrs\n}): [TensorInfo, TensorInfo] {\n backend_util.warn(\n 'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n 'Call tf.nonMaxSuppressionAsync() instead');\n\n const {inputs, backend, attrs} = args;\n const {boxes, scores} = inputs;\n const {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma} = attrs;\n\n const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n const maxOutputSizeVal = maxOutputSize;\n const iouThresholdVal = iouThreshold;\n const scoreThresholdVal = scoreThreshold;\n const softNmsSigmaVal = softNmsSigma;\n\n const {selectedIndices, selectedScores} = nonMaxSuppressionV5Impl(\n boxesVals, scoresVals, maxOutputSizeVal, iouThresholdVal,\n scoreThresholdVal, softNmsSigmaVal);\n\n return [\n backend.makeTensorInfo(\n [selectedIndices.length], 'int32', new Int32Array(selectedIndices)),\n backend.makeTensorInfo(\n [selectedScores.length], 'float32', new Float32Array(selectedScores))\n];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'webgl',\n kernelFunc: nonMaxSuppressionV5 as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class OneHotProgram implements GPGPUProgram {\n variableNames = ['indices'];\n outputShape: number[];\n userCode: string;\n\n // Caching uniform location for speed.\n seedLoc: WebGLUniformLocation;\n\n constructor(\n numIndices: number, depth: number, onValue: number, offValue: number) {\n this.outputShape = [numIndices, depth];\n this.userCode = `\n void main() {\n ivec2 coords = getOutputCoords();\n int index = round(getIndices(coords.x));\n setOutput(mix(float(${offValue}), float(${onValue}),\n float(index == coords.y)));\n }`;\n }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {OneHotProgram} from '../onehot_gpu';\n\nimport {reshape} from './Reshape';\n\nexport const oneHot = (args: {\n inputs: OneHotInputs,\n backend: MathBackendWebGL,\n attrs: OneHotAttrs\n}): TensorInfo => {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const indicesSize = util.sizeFromShape(indices.shape);\n const program = new OneHotProgram(indicesSize, depth, onValue, offValue);\n const reshaped =\n reshape({inputs: {x: indices}, backend, attrs: {shape: [indicesSize]}});\n const result = backend.runWebGLProgram(program, [reshaped], indices.dtype);\n backend.disposeIntermediateTensorInfo(reshaped);\n\n const outShape = [...indices.shape, depth];\n const out =
```

```

reshape({inputs: {x: result}, backend, attrs: {shape: outShape}});
backend.disposeIntermediateTensorInfo(result);
return out;
};
\n\nexport const oneHotConfig: KernelConfig =
{\n kernelName: OneHot,\n backendName: 'webgl',\n kernelFunc: oneHot as {} as KernelFunc\n};
\n", "/*\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
\n
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-
core';
\n\nimport {MathBackendWebGL} from '../backend_webgl';
\n\nimport {complex} from './Complex';
\n\nimport {fill} from './Fill';
\n\nimport {imag} from './Imag';
\n\nimport {real} from './Real';
\n\nexport function zerosLike(\n
args: {inputs: ZerosLikeInputs, backend: MathBackendWebGL}): TensorInfo {\n const {inputs, backend} = args;
\n\n const {x} = inputs;
\n\n if (x.dtype === 'complex64') {\n const realPart = real({inputs: {input: x}, backend});
\n\n const r = zerosLike({inputs: {x: realPart}, backend});
\n\n const imagPart = imag({inputs: {input: x}, backend});
\n\n const i = zerosLike({inputs: {x: imagPart}, backend});
\n\n const result = complex({inputs: {real: r, imag: i},
backend});
\n\n backend.disposeIntermediateTensorInfo(realPart);
\n\n backend.disposeIntermediateTensorInfo(r);
\n\n backend.disposeIntermediateTensorInfo(imagPart);
\n\n backend.disposeIntermediateTensorInfo(i);
\n\n return result;
\n } else {\n return fill({\n attrs: {\n shape:
x.shape,\n dtype: x.dtype,\n value: x.dtype === 'string' ? " : 0\n },\n backend\n });
\n }
\n}\n\nexport
const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'webgl',\n kernelFunc:
zerosLike as {} as KernelFunc\n};
\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs, TensorInfo} from '@tensorflow/tfjs-
core';
\n\nimport {MathBackendWebGL} from '../backend_webgl';
\n\nimport {complex} from './Complex';
\n\nimport {fill} from './Fill';
\n\nimport {imag} from './Imag';
\n\nimport {real} from './Real';
\n\nimport {zerosLike} from
'./ZerosLike';
\n\nexport function onesLike(\n args: {inputs: OnesLikeInputs, backend: MathBackendWebGL}):
TensorInfo {\n const {inputs, backend} = args;
\n\n const {x} = inputs;
\n\n if (x.dtype === 'string') {\n throw new
Error('onesLike is not supported under string dtype');
\n } else if (x.dtype === 'complex64') {\n const realPart =
real({inputs: {input: x}, backend});
\n\n const r = onesLike({inputs: {x: realPart}, backend});
\n\n const imagPart =
imag({inputs: {input: x}, backend});
\n\n const i = zerosLike({inputs: {x: imagPart}, backend});
\n\n const result =
complex({inputs: {real: r, imag: i}, backend});
\n\n backend.disposeIntermediateTensorInfo(realPart);
\n\n backend.disposeIntermediateTensorInfo(r);
\n\n backend.disposeIntermediateTensorInfo(imagPart);
\n\n backend.disposeIntermediateTensorInfo(i);
\n\n return result;
\n } else {\n // TODO(cais, smilkov): Add WebGL
shader for onesLike.\n // https://github.com/tensorflow/tfjs/issues/1293\n return fill({attrs: {shape: x.shape,
dtype: x.dtype, value: 1}, backend});
\n }
\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName:
OnesLike,\n backendName: 'webgl',\n kernelFunc: onesLike as {} as KernelFunc\n};
\n", "/*\n * @license\n *
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```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend: MathBackendWebGL, attrs: PackAttrs});\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n shape, t.shape, \n 'All tensors passed to stack must have matching shapes');\n util.assert(\n dtype === t.dtype, \n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(\n t => backend.disposeIntermediateTensorInfo(t);\n);\n\n return result;\n }\n\nexport const packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'webgl',\n kernelFunc: pack as {} as KernelFunc;\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from\n './shader_compiler';\n\nexport class PadProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n xShape: number[], paddings: Array<[number, number]>,\n constantValue: number) {\n this.outputShape = paddings.map(\n (p, i) => p[0] /* beforePad */\n + xShape[i] + p[1] /* afterPad */);\n const rank = xShape.length;\n const type = getCoordsDataType(rank);\n\n const start = paddings.map(p => p[0]).join(',');\n const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n\n const unpackedCoords =\n ['coords[0]', 'coords[1]', 'coords[2]', 'coords[3]'].slice(0, rank);\n\n if (rank === 1)\n {\n this.userCode = `\n int start = ${start};\n int end = ${end};\n\n void main() {\n int outC =\n getOutputCoords();\n if (outC < start || outC >= end) {\n setOutput(float(${constantValue}));\n }\n else {\n setOutput(getX(outC - start));\n }\n }\n `;\n }\n else {\n this.userCode = `\n ${type} start = ${type}(${start});\n ${type} end = ${type}(${end});\n\n void main() {\n ${type} outC =\n getOutputCoords();\n if (any(lessThan(outC, start)) || any(greaterThanEqual(outC, end))) {\n setOutput(float(${constantValue}));\n }\n else {\n ${type} coords = outC - start;\n setOutput(getX(${unpackedCoords}));\n }\n }\n `;\n }\n }\n\n /**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class PadPackedProgram implements GPGPUProgram {\n variableNames = ['x'];\n packedInputs = true;\n packedOutput = true;\n outputShape: number[];\n userCode:\n
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string;\n\n constructor(\n xShape: number[], paddings: Array<[number, number]>,\n constantValue: number)
{\n this.outputShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + xShape[i] + p[1] /* afterPad */);\n
const rank = xShape.length;\n const dtype = getCoordsDataType(rank);\n\n const start = paddings.map(p =>
p[0]).join(',');\n const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n const coords = getChannels('rc',
rank);\n const source = getChannels('source', rank);\n const cLimit = `${coords[rank - 1]} <
${this.outputShape[rank - 1]}`;\n const innerDims =\n rank === 1 ? 'source' : `vec2(${source.slice(-
2)}.join())`;\n\n const componentSetup = [\n `${dtype} rc = outputLoc;`, `${coords[rank - 1]} += 1;\n
if(${cLimit}) {\n `,\n rank === 1 ? " : "`\n rc = outputLoc;\n `${coords[rank - 2]} += 1;\n
if(${coords[rank - 2]} < ${this.outputShape[rank - 2]}) {\n `,\n rank === 1 ? " : "`\n `${coords[rank - 1]} += 1;\n
if(${cLimit}) {\n `;\n\n const paddingArea = rank === 1 ?\n 'rc < start || rc >= end' :\n 'any(lessThan(rc,
start)) || any(greaterThanEqual(rc, end))';\n let mainLoop = "\n for (let i = 0, j = rank === 1 ? 2 : 4; i < j; i++)
{\n mainLoop += `\n ${componentSetup[i]}\n if (${paddingArea}) {\n result[${i}] =
float(${constantValue});\n } else {\n ${dtype} source = rc - start;\n result[${i}] =
getChannel(getX(${source.join()}), ${innerDims});\n }\n `;\n }\n mainLoop += (rank === 1 ? ` ` :
` `);\n\n this.userCode = `\n const ${dtype} start = ${dtype}(${start});\n const ${dtype} end =
${dtype}(${end});\n\n void main() {\n ${dtype} outputLoc = getOutputCoords();\n vec4 result =
vec4(0.);\n ${mainLoop}\n setOutput(result);\n }\n `;\n }\n}\n\n", /*\n * @license\n * Copyright 2020
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may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {env, KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, TensorInfo} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {PadProgram} from
'../pad_gpu';\n\nimport {PadPackedProgram} from '../pad_packed_gpu';\n\nexport const padV2 = (\n args: {inputs:
PadV2Inputs, backend: MathBackendWebGL, attrs: PadV2Attrs}): \n TensorInfo => {\n const {inputs,
backend, attrs} = args;\n const {x} = inputs;\n const {paddings, constantValue} = attrs;\n\n const
program = env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n new PadPackedProgram(x.shape,
paddings, constantValue) :\n new PadProgram(x.shape, paddings, constantValue);\n return
backend.runWebGLProgram(program, [x], x.dtype);\n };\n\nexport const padV2Config: KernelConfig = {\n
kernelName: PadV2,\n backendName: 'webgl',\n kernelFunc: padV2 as {} as KernelFunc\n};\n\n", /*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, Pow} from '@tensorflow/tfjs-core';\n\nimport
{CHECK_NAN_SNIPPET} from '../binaryop_packed_gpu';\n\nimport {binaryKernelFunc} from
'../kernel_utils/kernel_funcs_utils';\n\nconst POW = \n if(a < 0.0 && floor(b) < b){\n return NAN;\n }\n if (b
== 0.0) {\n return 1.0;\n }\n return (round(mod(b, 2.0)) != 1) ?\n pow(abs(a), b) : sign(a) * pow(abs(a),
b);\n\nconst POW_PACKED = \n // isModRound1 has 1 for components with round(mod(b, 2.0)) == 1, 0
otherwise.\n vec4 isModRound1 = vec4(equal(round(mod(b, 2.0)), ivec4(1)));\n vec4 multiplier = sign(a) *
isModRound1 + (vec4(1.0) - isModRound1);\n vec4 result = multiplier * pow(abs(a), b);\n\n // Ensure that a^0 = 1,
including 0^0 = 1 as this correspond to TF and JS\n bvec4 isExpZero = equal(b, vec4(0.0));\n result.r =

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isExpZero.r ? 1.0 : result.r;\n result.g = isExpZero.g ? 1.0 : result.g;\n result.b = isExpZero.b ? 1.0 : result.b;\n
result.a = isExpZero.a ? 1.0 : result.a;\n\n vec4 isNaN = vec4(lessThan(a, vec4(0.0))) * vec4(lessThan(floor(b),
b));\n ` +\n CHECK_NAN_SNIPPET + `\n return result;\n`;\n\nexport const pow =\n
binaryKernelFunc({opSnippet: POW, packedOpSnippet: POW_PACKED});\n\nexport const powConfig:
KernelConfig = {\n kernelName: Pow,\n backendName: 'webgl',\n kernelFunc: pow as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport
const range =\n (args: {backend: MathBackendWebGL, attrs: RangeAttrs}): TensorInfo => {\n const {backend,
attrs} = args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step,
dtype);\n return backend.makeTensorInfo([values.length], dtype, values);\n };\n\nexport const rangeConfig:
KernelConfig = {\n kernelName: Range,\n backendName: 'webgl',\n kernelFunc: range as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {KernelConfig, Reciprocal} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from
../kernel_utils/kernel_funcs_utils;\n\nconst RECIPROCAL = `return 1.0 / x;`;\n\nexport const reciprocal =
unaryKernelFunc({opSnippet: RECIPROCAL});\n\nexport const reciprocalConfig: KernelConfig = {\n
kernelName: Reciprocal,\n backendName: 'webgl',\n kernelFunc: reciprocal,\n};\n", "/*\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Relu} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from
../kernel_utils/kernel_funcs_utils;\n\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst RELU =
CHECK_NAN_SNIPPET + `\n return (x < 0.0) ? 0.0 : x;\n`;\n\nconst RELU_PACKED = `\n vec4 result = x *
vec4(greaterThanEqual(x, vec4(0.0))); \n bvec4 isNaN = isnan(x);\n\n result.r = isNaN.r ? x.r : result.r;\n
result.g =
isNaN.g ? x.g : result.g;\n result.b = isNaN.b ? x.b : result.b;\n result.a = isNaN.a ? x.a : result.a;\n\n
return
result;\n`;\n\nexport const relu =\n unaryKernelFunc({opSnippet: RELU, packedOpSnippet:
RELU_PACKED});\n\nexport const reluConfig: KernelConfig = {\n kernelName: Relu,\n backendName:
'webgl',\n kernelFunc: relu as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All
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file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

```

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```
=====
*\n\nimport {KernelConfig, KernelFunc, Relu6} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n'./kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\nconst RELU6 =\nCHECK_NAN_SNIPPET + `\n return (x < 0.0) ? 0.0 : min(6.0, x);`\n;\nconst RELU6_PACKED = `\n vec4\n result = min(x, vec4(6.)) * vec4(greaterThanEqual(x, vec4(0.0)));`\n;\n bvec4 isNaN = isNaN(x);\n result.r = isNaN.r\n ? x.r : result.r;\n result.g = isNaN.g ? x.g : result.g;\n result.b = isNaN.b ? x.b : result.b;\n result.a = isNaN.a ? x.a :\n result.a;\n\n return result;`\n;\n\nexport const relu6 = unaryKernelFunc({opSnippet: RELU6, packedOpSnippet:\nRELU6_PACKED});\n\nexport const relu6Config: KernelConfig = {\n kernelName: Relu6,\n backendName:\n'webgl',\n kernelFunc: relu6 as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *\n http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n */\n=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\nexport class ResizeBilinearProgram implements\nGPGPUProgram {\n variableNames = ['A'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n inputShape: [number, number, number, number], newHeight: number,\n newWidth: number, alignCorners:\n boolean, halfPixelCenters: boolean) {\n const [batch, oldHeight, oldWidth, depth] = inputShape;\n this.outputShape = [batch, newHeight, newWidth, depth];\n const effectiveInSize: [number, number] = [\n (alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,\n (alignCorners && newWidth > 1) ? oldWidth -\n 1 : oldWidth\n];\n const effectiveOutSize: [number, number] = [\n (alignCorners && newHeight > 1) ?\n newHeight - 1 : newHeight,\n (alignCorners && newWidth > 1) ? newWidth - 1 : newWidth\n];\n let\n sourceFracIndexRC: string;\n if (halfPixelCenters) {\n sourceFracIndexRC = `(vec2(yRC) + vec2(0.5))\n * effectiveInputOverOutputRatioRC` +\n ` - vec2(0.5)`;\n } else {\n sourceFracIndexRC = `vec2(yRC) *\n effectiveInputOverOutputRatioRC`;\n }\n this.userCode = `\n const vec2\n effectiveInputOverOutputRatioRC = vec2(\n ${effectiveInSize[0] / effectiveOutSize[0]},\n ${effectiveInSize[1] / effectiveOutSize[1]});\n const vec2 inputShapeRC = vec2(${oldHeight}.0,\n ${oldWidth}.0);\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int d\n = coords[3];\n ivec2 yRC = coords.yz;\n // Fractional source index.\n vec2 sourceFracIndexRC =\n ${sourceFracIndexRC};\n // Compute the four integer indices.\n ivec2 sourceFloorRC =\n ivec2(max(sourceFracIndexRC, vec2(0.0)));\n ivec2 sourceCeilRC = ivec2(\n min(inputShapeRC - 1.0,\n ceil(sourceFracIndexRC)));\n float topLeft = getA(b, sourceFloorRC.x, sourceFloorRC.y, d);\n float\n bottomLeft = getA(b, sourceCeilRC.x, sourceFloorRC.y, d);\n float\n topRight = getA(b, sourceFloorRC.x,\n sourceCeilRC.y, d);\n float\n bottomRight = getA(b, sourceCeilRC.x, sourceCeilRC.y, d);\n vec2 fracRC =\n sourceFracIndexRC - vec2(sourceFloorRC);\n float top = topLeft + (topRight - topLeft) * fracRC.y;\n float\n bottom = bottomLeft + (bottomRight - bottomLeft) * fracRC.y;\n float\n newValue = top + (bottom - top) *\n fracRC.x;\n setOutput(newValue);\n }\n `;\n }\n\n"/**\n * @license\n * Copyright 2019 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *\n http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====
*/nimport {GPGPUProgram} from './gpgpu_math';nexport class ResizeBilinearPackedProgram implements
GPGPUProgram {n variableNames = ['A'];n packedInputs = true;n packedOutput = true;n outputShape:
number[] = [];n userCode: string;n constructor(n inputShape: [number, number, number, number],
newHeight: number,n newWidth: number, alignCorners: boolean, halfPixelCenters: boolean) {n const [batch,
oldHeight, oldWidth, depth] = inputShape;n this.outputShape = [batch, newHeight, newWidth, depth];n const
effectiveInSize: [number, number] = [n (alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,n
(alignCorners && newWidth > 1) ? oldWidth - 1 : oldWidthn];n const effectiveOutSize: [number, number]
= [n (alignCorners && newHeight > 1) ? newHeight - 1 : newHeight,n (alignCorners && newWidth > 1) ?
newWidth - 1 : newWidthn];n let sourceFracIndexRC: string;n if (halfPixelCenters) {n
sourceFracIndexRC = `(vec3(yRC) + vec3(0.5)) * ` +n `effectiveInputOverOutputRatioRC - vec3(0.5)`;n }
else {n sourceFracIndexRC = `vec3(yRC) * effectiveInputOverOutputRatioRC`;n }n this.userCode = `n
const vec3 effectiveInputOverOutputRatioRC = vec3(n ${effectiveInSize[0] / effectiveOutSize[0]},n
${effectiveInSize[1] / effectiveOutSize[1]},n ${effectiveInSize[1] / effectiveOutSize[1]});n const vec3
inputShapeRC = vec3(${oldHeight}.0, ${oldWidth}.0,n ${oldWidth}.0);n float
getAValue(int b, int r, int c, int d) {n return getChannel(getA(b, r, c, d), vec2(c, d));n }n void main()
{n ivec4 coords = getOutputCoords();n int b = coords[0];n int d = coords[3];n // Calculate
values for next column in yRC.z.n ivec3 yRC = coords.yzz + ivec3(0, 0, 1);n // Fractional source
index.n vec3 sourceFracIndexRC = ${sourceFracIndexRC};n // Compute the four integer indices.n
ivec3 sourceFloorRC = ivec3(max(sourceFracIndexRC, vec3(0.0)));n ivec3 sourceCeilRC = ivec3(n
min(inputShapeRC - 1.0, ceil(sourceFracIndexRC)));n // Should we calculate next column and row elements
in 2x2 packed cell.n bool hasNextCol = d < ${depth - 1};n bool hasNextRow = coords.z < ${newWidth -
1};n // In parallel, construct four corners for all four components in // packed 2x2 cell.n vec4
topLeft = vec4(n getAValue(b, sourceFloorRC.x, sourceFloorRC.y, d),n hasNextCol ? getAValue(b,
sourceFloorRC.x, sourceFloorRC.y, d + 1)n : 0.0,n hasNextRow ? getAValue(b,
sourceFloorRC.x, sourceFloorRC.z, d)n : 0.0,n (hasNextRow && hasNextCol) ?n
getAValue(b, sourceFloorRC.x, sourceFloorRC.z, d + 1) : 0.0);n vec4 bottomLeft = vec4(n
getAValue(b, sourceCeilRC.x, sourceFloorRC.y, d),n hasNextCol ? getAValue(b, sourceCeilRC.x,
sourceFloorRC.y, d + 1)n : 0.0,n hasNextRow ? getAValue(b, sourceCeilRC.x, sourceFloorRC.z,
d)n : 0.0,n (hasNextRow && hasNextCol) ?n getAValue(b, sourceCeilRC.x,
sourceFloorRC.z, d + 1) : 0.0);n vec4 topRight = vec4(n getAValue(b, sourceFloorRC.x,
sourceCeilRC.y, d),n hasNextCol ? getAValue(b, sourceFloorRC.x, sourceCeilRC.y, d + 1)n :
0.0,n hasNextRow ? getAValue(b, sourceFloorRC.x, sourceCeilRC.z, d)n : 0.0,n
(hasNextRow && hasNextCol) ?n getAValue(b, sourceFloorRC.x, sourceCeilRC.z, d + 1) : 0.0);n
vec4 bottomRight = vec4(n getAValue(b, sourceCeilRC.x, sourceCeilRC.y, d),n hasNextCol ?
getAValue(b, sourceCeilRC.x, sourceCeilRC.y, d + 1)n : 0.0,n hasNextRow ? getAValue(b,
sourceCeilRC.x, sourceCeilRC.z, d)n : 0.0,n (hasNextRow && hasNextCol) ?n
getAValue(b, sourceCeilRC.x, sourceCeilRC.z, d + 1) : 0.0);n vec3 fracRC = sourceFracIndexRC -
vec3(sourceFloorRC);n vec4 top = mix(topLeft, topRight, fracRC.yzz);n vec4 bottom =
mix(bottomLeft, bottomRight, fracRC.yzz);n vec4 newValue = mix(top, bottom, fracRC.x);n
setOutput(newValue);n }n `;n }n }n }n`,/*n * @licensen * Copyright 2020 Google LLC. All Rights
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http://www.apache.org/licenses/LICENSE-2.0n *n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.n * See the License for the specific language
governing permissions andn * limitations under the License.n *
```

```

=====
*\n\nimport {env, KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs,
TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport
{ResizeBilinearProgram} from '../resize_bilinear_gpu';\n\nimport {ResizeBilinearPackedProgram} from
'../resize_bilinear_packed_gpu';\n\nexport function resizeBilinear(args: {\n inputs: ResizeBilinearInputs,\n
backend: MathBackendWebGL,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} =
args;\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n\n const [newHeight,
newWidth] = size;\n\n const program = env().getBool('WEBGL_PACK_IMAGE_OPERATIONS') ?\n new
ResizeBilinearPackedProgram(\n images.shape as [number, number, number, number], newHeight,
newWidth,\n alignCorners, halfPixelCenters) : \n new ResizeBilinearProgram(\n images.shape as
[number, number, number, number], newHeight, newWidth,\n alignCorners, halfPixelCenters);\n return
backend.runWebGLProgram(program, [images], 'float32');\n\n\nexport const resizeBilinearConfig: KernelConfig =
{\n kernelName: ResizeBilinear,\n backendName: 'webgl',\n kernelFunc: resizeBilinear as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ResizeBilinearBackpropProgram implements
GPGPUProgram {\n variableNames = ['dy'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n dyShape: [number, number, number, number],\n inputShape: [number, number, number, number],
alignCorners: boolean) {\n this.outputShape = inputShape;\n const [, xHeight, xWidth,] = inputShape;\n const
[, yHeight, yWidth] = dyShape;\n\n // In the backwards pass, we want to find the pixels that were generated for\n
// each pixel in the input image the forward pass and add the corresponding\n // coefficient from dy to the gradient
(with some interpolation).\n\n const effectiveXSize: [number, number] = [\n (alignCorners && yHeight > 1) ?
xHeight - 1 : xHeight,\n (alignCorners && yWidth > 1) ? xWidth - 1 : xWidth\n];\n\n const effectiveYSize:
[number, number] = [\n (alignCorners && yHeight > 1) ? yHeight - 1 : yHeight,\n (alignCorners && yWidth
> 1) ? yWidth - 1 : yWidth\n];\n\n const heightScale = effectiveXSize[0] / effectiveYSize[0];\n const
widthScale = effectiveXSize[1] / effectiveYSize[1];\n\n const invHeightScale = 1 / heightScale;\n const
invWidthScale = 1 / widthScale;\n\n // This defines the size of the window of values around a particular\n //
index in dy that we want to search for contributions to dx.\n const winHeight = (Math.ceil(invHeightScale) * 2) +
2;\n const winWidth = (Math.ceil(invWidthScale) * 2) + 2;\n\n this.userCode = `\n void main() {\n ivec4
coords = getOutputCoords();\n int b = coords[0];\n int d = coords[3];\n int r = coords[1];\n int c =
coords[2];\n\n float accumulator = 0.0;\n\n const float heightScale = float(${heightScale});\n const
float widthScale = float(${widthScale});\n const float invHeightScale = float(${invHeightScale});\n const
float invWidthScale = float(${invWidthScale});\n const int winHeight = int(${winHeight});\n const int
winWidth = int(${winWidth});\n\n // Compute bounds for where in dy we will look\n float startRLerp =
floor(float(r) * invHeightScale);\n int startDyR = int(startRLerp - float(winHeight / 2));\n\n float startCLerp
= floor(float(c) * invWidthScale);\n int startDyC = int(startCLerp - float(winWidth / 2));\n\n // Loop over
dy\n for (int dyROffset = 0; dyROffset < winHeight; dyROffset++) {\n int dyR = dyROffset +
startDyR;\n\n // Guard against the window exceeding the bounds of dy\n if (dyR < 0 || dyR >=
${yHeight}) {\n continue;\n }\n\n for (int dyCOffset = 0; dyCOffset < winWidth; dyCOffset++)
{\n int dyC = dyCOffset + startDyC;\n\n // Guard against the window exceeding the bounds of dy\n
 if (dyC < 0 || dyC >= ${yWidth}) {\n continue;\n }\n\n float dxR = float(dyR) *
heightScale;\n int topDxRIndex = int(floor(dxR));\n int bottomDxRIndex = int(min(ceil(dxR),
=====

```



```

 float dxRLerp = dxR - float(topDxCIndex);
 float inverseDxRLerp = 1.0 - dxRLerp;
 float dxC = float(dyC) * widthScale;
 int leftDxCIndex = int(floor(dxC));
 int rightDxCIndex = int(min(ceil(dxC), xWidth - 1));
 float dxCLerp = dxC - float(leftDxCIndex);
 float inverseDxCLerp = 1.0 - dxCLerp;
 if (r == topDxCIndex && c == leftDxCIndex) {
 // topLeft
 accumulator += getDy(b, dyR, dyC, d) * inverseDxRLerp * inverseDxCLerp;
 }
 if (r == topDxCIndex && c == rightDxCIndex) {
 // topRight
 accumulator += getDy(b, dyR, dyC, d) * inverseDxRLerp * dxCLerp;
 }
 if (r == bottomDxCIndex && c == leftDxCIndex) {
 // bottomLeft
 accumulator += getDy(b, dyR, dyC, d) * dxRLerp * inverseDxCLerp;
 }
 if (r == bottomDxCIndex && c == rightDxCIndex) {
 // bottomRight
 accumulator += getDy(b, dyR, dyC, d) * dxRLerp * dxCLerp;
 }
}
// End loop over dy
setOutput(accumulator);
}
}
}

//===
*/
import { KernelConfig, KernelFunc, ResizeBilinearGrad, ResizeBilinearGradAttrs, ResizeBilinearGradInputs, TensorInfo } from '@tensorflow/tfjs-core';
import { MathBackendWebGL } from '../backend_webgl';
import { ResizeBilinearBackpropProgram } from './resize_bilinear_backprop_gpu';
export function resizeBilinearGrad(args: { inputs: ResizeBilinearGradInputs, backend: MathBackendWebGL, attrs: ResizeBilinearGradAttrs }): TensorInfo {
 const { inputs, backend, attrs } = args;
 const { images, dy } = inputs;
 const { alignCorners } = attrs;
 const program = new ResizeBilinearBackpropProgram(dy.shape as [number, number, number, number], images.shape as [number, number, number, number], alignCorners);
 return backend.runWebGLProgram(program, [dy], dy.dtype);
}
export const resizeBilinearGradConfig: KernelConfig = {
 kernelName: ResizeBilinearGrad,
 backendName: 'webgl',
 kernelFunc: resizeBilinearGrad as KernelFunc
};
"/**
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 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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 * limitations under the License.
 */
//===
*/
import { GPGPUProgram } from './gpgpu_math';
export class ResizeNearestNeighborProgram implements GPGPUProgram {
 variableNames = ['A'];
 outputShape: number[] = [];
 userCode: string;
 constructor(inputShape: [number, number, number, number], newHeight: number, newWidth: number, alignCorners: boolean, halfPixelCenters: boolean) {
 const [batch, oldHeight, oldWidth, depth] = inputShape;
 this.outputShape = [batch, newHeight, newWidth, depth];
 const effectiveInSize: [number, number] = [alignCorners && newHeight > 1 ? oldHeight - 1 : oldHeight, alignCorners && newWidth > 1 ? oldWidth - 1 : oldWidth];
 const effectiveOutSize: [number, number] = [alignCorners && newHeight > 1 ? newHeight - 1 : newHeight, alignCorners && newWidth > 1 ? newWidth - 1 : newWidth];
 // When align corners is false, we rounds the value with floor.
 const roundBase = alignCorners ? '0.5' : '0.0';
 let sourceFracIndexRC: string;
 if (halfPixelCenters) {
 sourceFracIndexRC = `max((vec2(yRC) + vec2(0.5)) * effectiveInputOverOutputRatioRC` + ` , vec2(0.0))`;
 } else {
 sourceFracIndexRC = `vec2(yRC) * effectiveInputOverOutputRatioRC`;
 }
 this.userCode = `
 const vec2 effectiveInputOverOutputRatioRC = vec2(
 ${effectiveInSize[0] / effectiveOutSize[0]},
 ${effectiveInSize[1] / effectiveOutSize[1]}
);
 `;
 }
}

```

```

 ${effectiveInSize[1] / effectiveOutSize[1]);\n const vec2 inputShapeRC = vec2(${oldHeight}.0,
 ${oldWidth}.0);\n\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int d
 = coords[3];\n ivec2 yRC = coords.yz;\n\n // Fractional source index.\n vec2 sourceFracIndexRC =
 ${sourceFracIndexRC};\n\n // Compute the coordinators of nearest neighbor point.\n ivec2
 sourceNearestRC = ivec2(\n min(inputShapeRC - 1.0, floor(sourceFracIndexRC + ${roundBase}));\n
 float newValue = getA(b, sourceNearestRC.x, sourceNearestRC.y, d);\n\n setOutput(newValue);\n }\n `;\n
 }\n}\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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 may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required
 by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
 BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
 License for the specific language governing permissions and\n * limitations under the License.\n *
 =====\n
 *\n\nimport {KernelConfig, KernelFunc, ResizeNearestNeighbor, ResizeNearestNeighborAttrs,
 ResizeNearestNeighborInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from
 './backend_webgl';\nimport {ResizeNearestNeighborProgram} from './resize_nearest_neighbor_gpu';\n\nexport
 function resizeNearestNeighbor(args: {\n inputs: ResizeNearestNeighborInputs,\n backend:
 MathBackendWebGL,\n attrs: ResizeNearestNeighborAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} =
 args;\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n\n const [newHeight,
 newWidth] = size;\n\n const program = new ResizeNearestNeighborProgram(\n images.shape as [number,
 number, number, number], newHeight, newWidth,\n alignCorners, halfPixelCenters);\n return
 backend.runWebGLProgram(program, [images], images.dtype);\n}\n\nexport const resizeNearestNeighborConfig:
 KernelConfig = {\n kernelName: ResizeNearestNeighbor,\n backendName: 'webgl',\n kernelFunc:
 resizeNearestNeighbor as {\n } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights
 Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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 http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
 =====\n
 *\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ResizeNearestNeighborBackpropProgram
 implements GPGPUProgram {\n variableNames = ['dy'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n dyShape: [number, number, number, number],\n inputShape: [number, number, number,
 number], alignCorners: boolean) {\n this.outputShape = inputShape;\n const [, xHeight, xWidth,] =
 inputShape;\n const [, yHeight, yWidth] = dyShape;\n\n // In the backwards pass, we want to find the pixels that
 were generated for\n // each pixel in the input image the forward pass and add the corresponding\n // coefficient
 from dy to the gradient (with some interpolation).\n\n const effectiveXSize: [number, number] = [\n
 (alignCorners && yHeight > 1) ? xHeight - 1 : xHeight,\n (alignCorners && yWidth > 1) ? xWidth - 1 :
 xWidth\n];\n\n const effectiveYSize: [number, number] = [\n (alignCorners && yHeight > 1) ? yHeight - 1 :
 yHeight,\n (alignCorners && yWidth > 1) ? yWidth - 1 : yWidth\n];\n\n const heightScale =
 effectiveXSize[0] / effectiveYSize[0];\n const widthScale = effectiveXSize[1] / effectiveYSize[1];\n\n const
 invHeightScale = 1 / heightScale;\n const invWidthScale = 1 / widthScale;\n\n // This defines the size of the
 window of values around a particular\n // index in dy that we want to search for contributions to dx.\n const
 winHeight = (Math.ceil(invHeightScale) * 2) + 2;\n const winWidth = (Math.ceil(invWidthScale) * 2) + 2;\n\n this.userCode = `\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int d =
 coords[3];\n int r = coords[1];\n int c = coords[2];\n\n float accumulator = 0.0;\n\n const float
 heightScale = float(${heightScale});\n const float widthScale = float(${widthScale});\n\n const float

```

```

invHeightScale = float({invHeightScale});\n const float invWidthScale = float({invWidthScale});\n\nconst int winHeight = int({winHeight});\n const int winWidth = int({winWidth});\n\n // Compute bounds
for where in dy we will look\n float startRLerp = floor(float(r) * invHeightScale);\n int startDyR =
int(floor(startRLerp - float(winHeight / 2)));
\n\n float startCLerp = floor(float(c) * invWidthScale);\n int
startDyC = int(floor(startCLerp - float(winWidth / 2)));
\n\n // Loop over dy\n for (int dyROffset = 0;
dyROffset < winHeight; dyROffset++) {\n int dyR = dyROffset + startDyR;\n\n // Guard against the
window exceeding the bounds of dy\n if (dyR < 0 || dyR >= {yHeight}) {\n continue;\n }\n\n for (int dyCOffset = 0; dyCOffset < winWidth; dyCOffset++) {\n int dyC = dyCOffset + startDyC;\n\n // Guard against the window exceeding the bounds of dy\n if (dyC < 0 || dyC >= {yWidth}) {\n continue;\n }\n\n float sourceFracRow =\n float({effectiveXSize[0]}) *\n (float(dyR) / float({effectiveYSize[0]}));\n\n float sourceFracCol =\n float({effectiveXSize[1]}) *\n (float(dyC) / float({effectiveYSize[1]}));\n\n int sourceNearestRow = int(min(\n float(int({xHeight}) - 1),\n {alignCorners} ? float(round(sourceFracRow)) :\n float(floor(sourceFracRow)));\n\n int sourceNearestCol = int(min(\n float(int({xWidth}) - 1),\n {alignCorners} ? float(round(sourceFracCol)) :\n float(floor(sourceFracCol)));\n\n if (r == sourceNearestRow && c == sourceNearestCol) {\n accumulator += getDy(b, dyR, dyC, d);\n }\n }\n }\n\n // End loop over dy\n\n setOutput(accumulator);\n\n `;\n}\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { KernelConfig, KernelFunc, ResizeNearestNeighborGrad, ResizeNearestNeighborGradAttrs,
ResizeNearestNeighborGradInputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL }
from './backend_webgl';\n\nimport { ResizeNearestNeighborBackpropProgram } from
'./resize_nearest_neighbor_backprop_gpu';\n\nexport function resizeNearestNeighborGrad(args: {\n inputs:
ResizeNearestNeighborGradInputs,\n backend: MathBackendWebGL,\n attrs:
ResizeNearestNeighborGradAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {images, dy} =
inputs;\n const {alignCorners} = attrs;\n\n const program = new ResizeNearestNeighborBackpropProgram(\n
dy.shape as [number, number, number, number],\n images.shape as [number, number, number, number],
alignCorners);\n return backend.runWebGLProgram(program, [dy], dy.dtype);\n}\n\nexport const
resizeNearestNeighborGradConfig: KernelConfig = {\n kernelName: ResizeNearestNeighborGrad,\n backendName: 'webgl',\n kernelFunc: resizeNearestNeighborGrad as {} as KernelFunc\n};\n\n"/**\n * @license\n *
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agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { GPGPUProgram } from './gpgpu_math';\n\nimport { getCoordsDataType } from
'./shader_compiler';\n\nexport class ReverseProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n constructor(xShape: number[], axis: number[]) {\n const rank =
xShape.length;\n if (rank > 4) {\n throw new Error(`WebGL backend: Reverse of rank-${rank} tensor
is not yet supported`);\n }\n this.outputShape = xShape;\n\n if (rank === 1) {\n this.userCode = `\n
void main() {\n int coord = getOutputCoords();\n setOutput(getX({xShape[0]} - coord - 1));\n }\n`;\n }\n }\n}

```

```

`;n return;n }n const getInCoord = (i: number) => {n if (axis.indexOf(i) !== -1 && xShape[i] !== 1)
{n return `${xShape[i]} - coords[${i}] - 1`;n }n return `coords[${i}]`;n };n const inCoords =
xShape.map((_, i) => getInCoord(i)).join(',');n const type = getCoordsDataType(rank);n this.userCode = `n
void main() {n ${type} coords = getOutputCoords();n setOutput(getX(${inCoords}));n }n `;n
}n}n", "/*n * @licensen * Copyright 2019 Google LLC. All Rights Reserved.n * Licensed under the Apache
License, Version 2.0 (the "License");n * you may not use this file except in compliance with the License.n * You
may obtain a copy of the License atn *n * http://www.apache.org/licenses/LICENSE-2.0n *n * Unless required
by applicable law or agreed to in writing, softwaren * distributed under the License is distributed on an "AS IS"
BASIS,n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.n * See the
License for the specific language governing permissions andn * limitations under the License.n *

```

```

=====n
*/n\nimport {GPGPUProgram} from './gpgpu_math';nimport {getChannels} from './packing_util';nimport
{getCoordsDataType} from './shader_compiler';n\nexport class ReversePackedProgram implements
GPGPUProgram {n variableNames = ['x'];n outputShape: number[];n userCode: string;n packedInputs =
true;n packedOutput = true;n\n constructor(xShape: number[], axis: number[]) {n const rank =
xShape.length;n if (rank > 4) {n throw new Error(`n `WebGL backend: Reverse of rank-${rank} tensor
is not yet supported`);n }n this.outputShape = xShape;n const channels = getChannels('rc', rank);n const
nextColumn =n `${channels[rank - 1]} + 1 < ${this.outputShape[rank - 1]}`;n const nextRow =
`${channels[rank - 2]} + 1 < ${this.outputShape[rank - 2]}`;n const type = getCoordsDataType(rank);n if (rank
=== 1) {n this.userCode = `n void main(){n int rc = getOutputCoords();n vec4 result =
vec4(0.);n result.r = getChannel(getX(${xShape[0]} - rc - 1),n ${xShape[0]} - rc - 1);n
if(${nextColumn}){n result.g = getChannel(getX(${xShape[0]} - (rc + 1) - 1),n ${xShape[0]} -
(rc + 1) - 1);n }n setOutput(result);n }n `;n } else {n this.userCode = `n void
main() {n ${type} rc = getOutputCoords();n vec4 result = vec4(0.);n result.r =
${getR(channels.slice())};n if(${nextColumn}){n result.g = ${getG(channels.slice())};n }n
if(${nextRow}) {n result.b = ${getB(channels.slice())};n if(${nextColumn}) {n result.a =
${getA(channels.slice())};n }n }n setOutput(result);n }n `;n }n\n function
getR(channels: string[]): string {n return getChannel(channels);n }n\n function getG(channels: string[]):
string {n channels[rank - 1] = '(' + channels[rank - 1] + ` + 1)`;n return getChannel(channels);n }n\n
function getB(channels: string[]): string {n channels[rank - 2] = '(' + channels[rank - 2] + ` + 1)`;n return
getChannel(channels);n }n\n function getA(channels: string[]): string {n channels[rank - 1] = '(' +
channels[rank - 1] + ` + 1)`;n channels[rank - 2] = '(' + channels[rank - 2] + ` + 1)`;n return
getChannel(channels);n }n\n function getChannel(channels: string[]): string {n const inCoordsArray =
xShape.map((_, i) => getInCoord(i, channels));n const inCoords = inCoordsArray.join(',');n const innerDims
= inCoordsArray.slice(-2).join(',');n return `getChannel(getX(${inCoords}), vec2(${innerDims}))`;n }n\n
function getInCoord(i: number, channels1: string[]): string {n if (axis.indexOf(i) !== -1 && xShape[i] !== 1) {n
 return `${xShape[i]} - ${channels1[i]} - 1`;n } else {n return `${channels1[i]}`;n }n }n
}n}n", "/*n * @licensen * Copyright 2020 Google LLC. All Rights Reserved.n * Licensed under the Apache
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BASIS,n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.n * See the
License for the specific language governing permissions andn * limitations under the License.n *

```

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=====n
*/n\nimport {env, KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';n\nimport {MathBackendWebGL} from './backend_webgl';n\nimport {ReverseProgram}
from './reverse_gpu';n\nimport {ReversePackedProgram} from './reverse_packed_gpu';n\nimport {identity} from
'./Identity';n\nexport function reverse(args: {n inputs: ReverseInputs,n backend: MathBackendWebGL,n attrs:

```

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ReverseAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} =
attrs;\n\n const xRank = x.shape.length;\n\n const $dims = util.parseAxisParam(dims, x.shape);\n if (xRank === 0)
{\n return identity({inputs: {x}, backend});\n }\n\n const program =
env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n new ReversePackedProgram(x.shape, $dims) :\n new ReverseProgram(x.shape, $dims);\n\n return backend.runWebGLProgram(program, [x,
x.dtype]);\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'webgl',\n
kernelFunc: reverse as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
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except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class RotateProgram implements GPGPUProgram {\n variableNames = ['Image'];\n
outputShape: number[] = [];\n userCode: string;\n\n constructor(\n imageShape: [number, number, number,
number], radians: number,\n fillValue: number|[number, number, number],\n center: number|[number,
number]) {\n const imageHeight = imageShape[1];\n const imageWidth = imageShape[2];\n const sinFactor =
Math.sin(radians).toFixed(3);\n const cosFactor = Math.cos(radians).toFixed(3);\n this.outputShape =
imageShape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight,
imageWidth);\n const centerXString = centerX.toFixed(3);\n const centerYString = centerY.toFixed(3);\n let
fillSnippet = '';\n if (typeof fillValue === 'number') {\n fillSnippet = `float outputValue =
${fillValue.toFixed(2)};`\n } else {\n fillSnippet = `\n vec3 fill = vec3(${fillValue.join(',')});\n float
outputValue = fill[coords[3]];`\n }\n\n this.userCode = `\n void main() {\n ivec4 coords =
getOutputCoords();\n int x = coords[2];\n int y = coords[1];\n float coordXFloat = (float(x) -
${centerXString}) * ${\n cosFactor} - (float(y) - ${centerYString}) * ${sinFactor};\n float coordYFloat =
(float(x) - ${centerXString}) * ${\n sinFactor} + (float(y) - ${centerYString}) * ${cosFactor};\n int
coordX = int(round(coordXFloat + ${centerXString}));\n int coordY = int(round(coordYFloat +
${centerYString}));\n ${fillSnippet}\n if(coordX >= 0 && coordX < ${imageWidth} && coordY >= 0
&& coordY < ${\n imageHeight}) {\n outputValue = getImage(coords[0], coordY, coordX, coords[3]);\n
}\n setOutput(outputValue);\n }\n `;\n }\n }\n", "/*\n * @license\n * Copyright 2020 Google LLC.
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file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {RotateWithOffset,
RotateWithOffsetAttrs, RotateWithOffsetInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL}
from './backend_webgl';\n\nimport {RotateProgram} from './rotate_gpu';\n\nexport const rotateWithOffsetConfig:
KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'webgl',\n kernelFunc: ({inputs, attrs,
backend}) => {\n const {image} = inputs as RotateWithOffsetInputs;\n const {radians, fillValue, center} = attrs
as { } as RotateWithOffsetAttrs;\n const webglBackend = backend as MathBackendWebGL;\n\n const program
= new RotateProgram(\n (image as Tensor4D).shape, radians, fillValue, center);\n const output =
webglBackend.runWebGLProgram(program, [image], image.dtype);\n return output;\n }\n};\n", "/*\n *
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```

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```
=====
*import {KernelConfig, Round} from '@tensorflow/tfjs-core';import {unaryKernelFunc} from
 './kernel_utils/kernel_funcs_utils';const ROUND = ` // OpenGL ES does not support round function. // The
 algorithm is based on banker's rounding. float base = floor(x); if ((x - base) < 0.5) { return floor(x);
 } else if ((x - base) > 0.5) { return ceil(x); } else { if (mod(base, 2.0) == 0.0) { return base; } else
 { return base + 1.0; } }`;
export const round = unaryKernelFunc({opSnippet: ROUND});
export const roundConfig: KernelConfig = { kernelName: Round, backendName: 'webgl', kernelFunc:
 round,};
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 on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied. See the License for the specific language governing permissions and limitations under the
 License.*/
```

```
=====
*import {GPGPUProgram} from './gpgpu_math';import {getCoordsDataType} from
 './shader_compiler';export class ScatterProgram implements GPGPUProgram {
 variableNames = ['updates',
 'indices', 'defaultValue'];
 outputShape: number[];
 userCode: string;
 constructor(updateSize: number,
 sliceDim: number, indicesRank: number,
 updatesRank: number, strides: number[], shape: number[],
 summingDupeIndex = true) {
 this.outputShape = shape;
 const stridesType =
 getCoordsDataType(strides.length);
 const dtype = getCoordsDataType(shape.length);
 let indicesString = "";
 if (indicesRank === 1) { indicesString = 'i'; } else if (indicesRank === 2) { indicesString = 'i, j'; }
 const indicesSnippet = `getIndices(${indicesString})`;
 let updatesString = "";
 if (updatesRank === 1) { updatesString = 'i'; } else if (updatesRank === 2) { updatesString = 'i, coords[1]'; }
 const updatesSnippet = `getUpdates(${updatesString})`;
 const strideString = sliceDim > 1 ? 'strides[j] : strides';
 this.userCode = ` ${stridesType} strides = ${stridesType}(${strides});
 void main() {
 ${dtype}
 coords = getOutputCoords();
 float sum = 0.0;
 bool found = false;
 for (int i = 0; i <
 ${updateSize}; i++) {
 int flattenedIndex = 0;
 for (int j = 0; j < ${sliceDim}; j++) {
 int
 index = round(${indicesSnippet});
 flattenedIndex += index * ${strideString};
 }
 if
 (flattenedIndex == coords[0]) {
 sum += ${updatesSnippet};
 found = true;
 }
 }
 setOutput(mix(getDefaultValue(), sum, float(found)));
 }`;
 }
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 WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language
 governing permissions and limitations under the License.*/
```

```
=====
*import {backend_util, KernelConfig, KernelFunc, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo}
 from '@tensorflow/tfjs-core';import {MathBackendWebGL} from './backend_webgl';import
 {ScatterProgram} from './scatter_gpu';import {reshape} from './Reshape';export function scatterNd(args: {
 inputs: ScatterNdInputs,
 backend: MathBackendWebGL,
 attrs: ScatterNdAttrs}): TensorInfo {
 const {inputs, backend, attrs} = args;
 const {indices, updates} = inputs;
 const {shape} = attrs;
 const {sliceRank,
```

```

numUpdates, sliceSize, strides, outputSize) =\n backend_util.calculateShapes(updates, indices, shape);\n\n const
flattenShape = [outputSize / sliceSize, sliceSize];\n\n if (outputSize === 0) {\n return
backend.makeTensorInfo(shape, indices.dtype);\n }\n\n const flattenIndices = reshape(\n {inputs: {x: indices},
backend, attrs: {shape: [numUpdates, sliceRank]}});\n const flattenX = reshape(\n {inputs: {x: updates},
backend, attrs: {shape: [numUpdates, sliceSize]}});\n\n const defaultValue = backend.makeTensorInfo(\n [],
'float32', new Float32Array([0])); // scalar(0)\n const program = new ScatterProgram(\n numUpdates,
sliceRank, flattenIndices.shape.length, flattenX.shape.length,\n strides, flattenShape);\n const res =
backend.runWebGLProgram(\n program, [flattenX, flattenIndices, defaultValue], flattenX.dtype);\n const
reshaped = reshape({inputs: {x: res}, backend, attrs: {shape}});\n\n
backend.disposeIntermediateTensorInfo(flattenIndices);\n backend.disposeIntermediateTensorInfo(flattenX);\n
backend.disposeIntermediateTensorInfo(res);\n backend.disposeIntermediateTensorInfo(defaultValue);\n\n return
reshaped;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName:
'webgl',\n kernelFunc: scatterNd as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC.
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'/shader_compiler';\n\nexport class SelectProgram implements GPGPUProgram {\n variableNames = ['c', 'a', 'b'];\n
outputShape: number[];\n userCode: string;\n\n constructor(cRank: number, shape: number[], rank: number) {\n
this.outputShape = shape;\n\n let cCoords;\n let abCoords;\n if (rank > 4) {\n throw Error(`Where for rank
${rank} is not yet supported`);\n }\n\n if (rank === 1) {\n abCoords = `resRC`;\n cCoords = `resRC`;\n
 } else {\n const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w'];\n const cCoordVars = [];\n
const abCoordVars = [];\n for (let i = 0; i < shape.length; i++) {\n
abCoordVars.push(`${currentCoords[i]}`);\n if (i < cRank) {\n
cCoordVars.push(`${currentCoords[i]}`);\n }\n }\n cCoords = cCoordVars.join();\n abCoords =
abCoordVars.join();\n }\n\n const dtype = getCoordsDataType(rank);\n\n this.userCode = `\n void main()
{\n ${dtype} resRC = getOutputCoords();\n float cVal = getC(${cCoords});\n if (cVal >= 1.0) {\n
setOutput(getA(${abCoords}));\n } else {\n setOutput(getB(${abCoords}));\n }\n }\n `;\n
}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, TensorInfo, upcastType} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {SelectProgram} from
'/select_gpu';\n\nexport function select(args: {inputs: SelectInputs, backend: MathBackendWebGL}): \n
TensorInfo {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const program = \n new
SelectProgram(condition.shape.length, t.shape, t.shape.length);\n return backend.runWebGLProgram(\n
program, [condition, t, e], upcastType(t.dtype, e.dtype));\n}\n\nexport const selectConfig: KernelConfig = {\n
kernelName: Select,\n backendName: 'webgl',\n kernelFunc: select as { } as KernelFunc\n};\n\n"/**\n * @license\n *
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```
=====
*\n\nimport {backend_util, KernelConfig, Selu} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\nconst SELU =`\n // Stable and Attracting Fixed Point (0, 1) for Normalized Weights.\n // see: https://arxiv.org/abs/1706.02515\n float scaleAlpha =\n ${backend_util.SELU_SCALEALPHA};\n float scale = ${backend_util.SELU_SCALE};\n return (x >= 0.0) ?\n scale * x : scaleAlpha * (exp(x) - 1.0);\n`;\n\nexport const selu = unaryKernelFunc({opSnippet: SELU});\n\nexport const seluConfig: KernelConfig = {\n kernelName: Selu,\n backendName: 'webgl',\n kernelFunc: selu,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
*\n\nimport {KernelConfig, Sigmoid} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\nconst SIGMOID = `return 1.0 / (1.0 + exp(-1.0 * x));`\n\nexport const sigmoid = unaryKernelFunc({opSnippet: SIGMOID});\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: Sigmoid,\n backendName: 'webgl',\n kernelFunc: sigmoid,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
\n\nimport {KernelConfig, Sign} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\n// Sign does not propagate NaNs.\nconst SIGN =`\n if (isnan(x)) { return 0.0; }\n return sign(x);\n`;\n\nexport const sign = unaryKernelFunc({opSnippet: SIGN});\n\nexport const signConfig: KernelConfig = {\n kernelName: Sign,\n backendName: 'webgl',\n kernelFunc: sign,\n};\n", "/\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {CHECK_NAN_SNIPPET_UNARY, unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\nconst SIN = CHECK_NAN_SNIPPET_UNARY +`\n return sin(x);\n`;\n\nexport const sin = unaryKernelFunc({opSnippet: SIN});\n\nexport const sinConfig: KernelConfig = {\n kernelName: Sin,\n backendName: 'webgl',\n kernelFunc: sin,\n};\n", "/\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
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```
=====\n*\n\nimport {KernelConfig, Sinh} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n './kernel_utils/kernel_funcs_utils';\n\nconst SINH =`\n float e2x = exp(x);\n return (e2x - 1.0 / e2x) /\n 2.0;\n`;\n\nexport const sinh = unaryKernelFunc({opSnippet: SINH});\n\nexport const sinhConfig: KernelConfig =\n {\n kernelName: Sinh,\n backendName: 'webgl',\n kernelFunc: sinh,\n};\n\n"/**\n * @license\n * Copyright 2020\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n
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```
=====\n*\n\nimport {KernelConfig, Softplus} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from\n './kernel_utils/kernel_funcs_utils';\n\nconst SOFTPLUS =`\n float epsilon = 1.1920928955078125e-7;\n float\n threshold = log(epsilon) + 2.0;\n bool too_large = x > -threshold;\n bool too_small = x < threshold;\n\n float\n result;\n float exp_x = exp(x);\n\n if (too_large){\n result = x;\n }\n else if (too_small){\n result = exp_x;\n }\n else{\n result = log(exp_x + 1.0);\n }\n return result;\n`;\n\nexport const softplus =\n unaryKernelFunc({opSnippet: SOFTPLUS});\n\nexport const softplusConfig: KernelConfig = {\n kernelName:\n Softplus,\n backendName: 'webgl',\n kernelFunc: softplus,\n};\n\n"/**\n * @license\n * Copyright 2020 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, SpaceToBatchND, SpaceToBatchNDAttrs,\n SpaceToBatchNDInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from\n './backend_webgl';\n\nimport {padV2} from './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose}\n from './Transpose';\n\nexport const spaceToBatchND = (args: {\n inputs: SpaceToBatchNDInputs,\n backend:\n MathBackendWebGL,\n attrs: SpaceToBatchNDAttrs\n}): TensorInfo => {\n const {inputs, backend, attrs} =\n args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n util.assert(\n x.shape.length <= 4,\n () => 'spaceToBatchND for rank > 4 with a WebGL backend not '\n +\n 'implemented yet');\n\n const prod =\n blockShape.reduce((a, b) => a * b);\n\n const completePaddings: Array<[number, number]> = [[0, 0];\n completePaddings.push(...paddings as Array<[number, number]>);\n for (let i = 1 + blockShape.length; i <\n x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n\n const toDispose = [];\n\n const paddedX =\n padV2({\n inputs: {x},\n backend,\n attrs: {paddings: completePaddings, constantValue: 0}\n });\n\n const\n reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const\n permutedReshapedPaddedPermutation =\n backend_util.getPermuted(\n reshapedPaddedShape.length,\n blockShape.length, false);\n\n const\n flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape,\n blockShape, prod, false);\n\n const\n reshapedPaddedX =\n reshape(\n {inputs: {x: paddedX}, backend, attrs:\n {shape: reshapedPaddedShape}});\n\n const\n paddedXT =\n transpose({\n inputs: {x: reshapedPaddedX},\n backend,\n attrs: {perm: permutedReshapedPaddedPermutation}\n });\n\n const\n result =\n reshape({inputs:\n {x: paddedXT}, backend, attrs: {shape: flattenShape}});\n\n toDispose.push(paddedX);\n toDispose.push(reshapedPaddedX);\n toDispose.push(paddedXT);\n\n toDispose.forEach(t =>
```

```
backend.disposeIntermediateTensorInfo(t));\n\n return result;\n};\n\nexport const spaceToBatchNDConfig:
KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'webgl',\n kernelFunc: spaceToBatchND as
{ } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */
```

```
=====\n\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, SparseToDense, SparseToDenseAttrs,
SparseToDenseInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from
 './backend_webgl';\nimport {ScatterProgram} from './scatter_gpu';\nimport {reshape} from './Reshape';\n\nexport
function sparseToDense(args: {\n inputs: SparseToDenseInputs,\n backend: MathBackendWebGL,\n attrs:
SparseToDenseAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {sparseIndices,
sparseValues, defaultValue} = inputs;\n const {outputShape} = attrs;\n\n const {sliceRank, numUpdates, strides,
outputSize} =\n backend_util.calculateShapes(sparseValues, sparseIndices, outputShape);\n\n const
sumDupeIndices = false;\n const program = new ScatterProgram(\n numUpdates, sliceRank,
sparseIndices.shape.length,\n sparseValues.shape.length, strides, [outputSize, 1], sumDupeIndices);\n\n const res
= backend.runWebGLProgram(\n program, [sparseValues, sparseIndices, defaultValue],
sparseValues.dtype);\n\n const reshaped =\n reshape({inputs: {x: res}, backend, attrs: {shape:
outputShape}});\n\n backend.disposeIntermediateTensorInfo(res);\n\n return reshaped;\n}\n\nexport const
sparseToDenseConfig: KernelConfig = {\n kernelName: SparseToDense,\n backendName: 'webgl',\n kernelFunc:
sparseToDense as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {slice} from
 './Slice';\n\nexport function splitV(\n args:\n {inputs: SplitVInputs, backend: MathBackendWebGL, attrs:
SplitVAttrs\n}): TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const
{numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n\n const xRank = x.shape.length;\n const begin = new
Array(xRank).fill(0);\n const size = x.shape.slice();\n\n return splitSizes.map(s => {\n const sliceSize =
[...size];\n sliceSize[$axis] = s;\n const sliceT =\n slice({inputs: {x}, backend, attrs: {begin, size:
sliceSize}});\n begin[$axis] += s;\n return sliceT;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'webgl',\n kernelFunc: splitV as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */
```

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=====\n\n
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*\n\nimport {KernelConfig, KernelFunc, Sqrt} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst Sqrt = `return sqrt(x);`\n\nexport const sqrt =
unaryKernelFunc({opSnippet: Sqrt});\n\nexport const sqrtConfig: KernelConfig = {\n kernelName: Sqrt,\n backendName: 'webgl',\n kernelFunc: sqrt as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst SQUARE = `return x * x;`\n\nexport const square =
unaryKernelFunc({opSnippet: SQUARE});\n\nexport const squareConfig: KernelConfig = {\n kernelName:
Square,\n backendName: 'webgl',\n kernelFunc: square,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, TensorInfo, UnaryInputs} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {CHECK_NAN_SNIPPET,
UnaryOpProgram} from './unaryop_gpu';\n\nexport function step(\n {inputs, attrs, backend}: {\n inputs:
UnaryInputs, attrs: StepAttrs, backend: MathBackendWebGL};\n TensorInfo {\n const {x} = inputs;\n const
opSnippet = CHECK_NAN_SNIPPET + `\n return x > 0.0 ? 1.0 : float(${attrs.alpha});\n `;\n\n const program =
new UnaryOpProgram(x.shape, opSnippet);\n\n return backend.runWebGLProgram(program, [x],
x.dtype);\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'webgl',\n kernelFunc: step as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class StridedSliceProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n constructor(begin: number[], strides: number[], size: number[]) {\n this.outputShape = size;\n const rank = size.length;\n const inputDtype = getCoordsDataType(size.length);\n const dtype = getCoordsDataType(size.length);\n\n let newCoords = ";\n if (rank === 1) {\n newCoords =
'coords * strides + begin';\n } else {\n let outputAxis = 0;\n newCoords =\n size.map((_, i) => {\n outputAxis++;\n return size.length === 1 ?\n `coords * strides[${i}] + begin[${i}]` :\n `coords[${outputAxis - 1}] * strides[${i}] + begin[${i}]`;\n }).join(',');\n }\n\n this.userCode = `\n ${inputDtype} begin = ${inputDtype}(${begin});\n ${inputDtype} strides =
${inputDtype}(${strides});\n\n void main() {\n ${dtype} coords = getOutputCoords();\n setOutput(getX(${newCoords}));\n }\n `;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All

```

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```
=====\n*\n\nimport {buffer, KernelConfig, KernelFunc, Rank, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorBuffer, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {stridedSliceImplCPU} from './kernel_utils/shared';\nimport {StridedSliceProgram} from './strided_slice_gpu';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nexport function stridedSlice(args: {\n inputs: StridedSliceInputs,\n backend: MathBackendWebGL,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n const {nonStrided, $begin, $strides, size, newShape, outShape} =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask,\n ellipsisMask,\n newAxisMask, shrinkAxisMask);\n const $x = reshape({inputs: {x}, backend, attrs: {shape: newShape}});\n let result;\n if (nonStrided) {\n const sliced = slice({inputs: {x: $x}, backend, attrs: {begin: $begin, size}});\n result = reshape({inputs: {x: sliced}, backend, attrs: {shape: outShape}});\n backend.disposeIntermediateTensorInfo(sliced);\n } else if (outShape.some(axis => axis === 0)) {\n result = backend.makeTensorInfo(outShape, x.dtype, []);\n } else {\n const shouldExecuteOnCPU = backend.shouldExecuteOnCPU([$x]);\n if (shouldExecuteOnCPU) {\n const xTexData = backend.texData.get($x.dataId);\n const values = xTexData.values as TypedArray;\n const xBuf = buffer($x.shape, $x.dtype, values) as TensorBuffer<Rank>;\n const resultValues =\n stridedSliceImplCPU(outShape, xBuf, $strides, $begin);\n result = backend.makeTensorInfo(outShape, $x.dtype, resultValues.values);\n } else {\n const program = new StridedSliceProgram($begin, $strides, outShape);\n result = backend.runWebGLProgram(program, [$x, $x.dtype]);\n }\n }\n const resultReshaped =\n reshape({inputs: {x: result}, backend, attrs: {shape: outShape}});\n backend.disposeIntermediateTensorInfo($x);\n backend.disposeIntermediateTensorInfo(result);\n return resultReshaped;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'webgl',\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\nconst TAN = `return tan(x);`\n\nexport const tan = unaryKernelFunc({opSnippet: TAN});\n\nexport const tanConfig: KernelConfig = {\n kernelName: Tan,\n backendName: 'webgl',\n kernelFunc: tan,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====
*\n\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst TANH = `\n float e2x = exp(-2.0 * abs(x));\n return sign(x) * (1.0 -
e2x) / (1.0 + e2x);\n`;\n\nexport const tanh = unaryKernelFunc({opSnippet: TANH});\n\nexport const tanhConfig:
KernelConfig = {\n kernelName: Tanh,\n backendName: 'webgl',\n kernelFunc: tanh,\n};\n";\n"/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class TileProgram implements GPGPUProgram {\n variableNames = ['A'];\n
outputShape: number[];\n userCode: string;\n rank: number;\n\n constructor(aShape: number[], reps: number[])
{\n const outputShape: number[] = new Array(aShape.length);\n for (let i = 0; i < outputShape.length; i++) {\n
outputShape[i] = aShape[i] * reps[i];\n }\n this.outputShape = outputShape;\n this.rank =
outputShape.length;\n const dtype = getCoordsDataType(this.rank);\n const sourceCoords =
getSourceCoords(aShape);\n\n this.userCode = `\n void main() {\n ${dtype} resRC = getOutputCoords();\n
setOutput(getA(${sourceCoords}));\n }\n `;\n }\n\n function getSourceCoords(aShape: number[]): string
{\n const rank = aShape.length;\n if (rank > 5) {\n throw Error('Tile for rank ${rank} is not yet supported');\n
}\n if (rank === 1) {\n return `imod(resRC, ${aShape[0]}`);\n }\n\n const currentCoords = ['resRC.x', 'resRC.y',
'resRC.z', 'resRC.w', 'resRC.u'];\n\n const sourceCoords = [];\n for (let i = 0; i < aShape.length; i++) {\n
sourceCoords.push(`imod(${currentCoords[i]}, ${aShape[i]}`);\n }\n return sourceCoords.join();\n }\n\n"/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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=====
*\n\nimport {buffer, KernelConfig, KernelFunc, TensorInfo, Tile, TileAttrs, TileInputs, util} from
'@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {tileImplCPU} from
'./kernel_utils/shared';\nimport {TileProgram} from './tile_gpu';\n\nexport function tile(\n params: {inputs:
TileInputs, backend: MathBackendWebGL, attrs: TileAttrs});\n TensorInfo {\n const {inputs, backend, attrs} =
params;\n const {x} = inputs;\n const {reps} = attrs;\n\n if (x.dtype === 'string') {\n // Even though string tensor
is always on CPU, just to be consistent on how\n // to access tensor data.\n const data =
backend.readSync(x.dataId) as Uint8Array[];\n const decodedData = data.map(d => util.decodeString(d));\n
const buf = buffer(x.shape, x.dtype, decodedData);\n const outBuf = tileImplCPU(buf, reps);\n return
backend.makeTensorInfo(outBuf.shape, outBuf.dtype, outBuf.values);\n }\n\n const program = new
TileProgram(x.shape, reps);\n const output = backend.runWebGLProgram(program, [x], x.dtype);\n\n return
output;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'webgl',\n
kernelFunc: tile as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this file
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software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
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=====

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```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, NumericDataType, TensorInfo, TopK, TopKAttrs, TopKInputs, TypedArray } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { topKImplCPU } from '../kernel_utils/shared';\nexport function topK(\n args: { inputs: TopKInputs, backend: MathBackendWebGL, attrs: TopKAttrs }):\n TensorInfo[] {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { k, sorted } = attrs;\n\n const xVals = backend.readSync(x.dataId) as TypedArray;\n const [allTopKVals, allTopKIndices] =\n topKImplCPU(xVals, x.shape, x.dtype as NumericDataType, k, sorted);\n\n return [\n backend.makeTensorInfo(\n allTopKVals.shape, allTopKVals.dtype, allTopKVals.values),\n backend.makeTensorInfo(\n allTopKIndices.shape, allTopKIndices.dtype, allTopKIndices.values)\n];\n}\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'webgl',\n kernelFunc: topK as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unique, UniqueAttrs, UniqueInputs } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { uniqueImplCPU } from '../kernel_utils/shared';\nimport { assertNotComplex } from '../webgl_util';\nexport function unique(\n args: {\n inputs: UniqueInputs, attrs: UniqueAttrs, backend: MathBackendWebGL\n }):\n TensorInfo[] {\n const { inputs, attrs, backend } = args;\n const { axis } = attrs;\n const { x } = inputs;\n assertNotComplex(x, 'unique');\n\n // For now, always forward calculation to the CPU backend.\n console.warn(\n 'WARNING: ',\n 'UI might be locked temporarily as data is being downloaded');\n const values = backend.readSync(x.dataId);\n const { outputValues, outputShape, indices } =\n uniqueImplCPU(values, axis, x.shape, x.dtype);\n return [\n backend.makeTensorInfo(outputShape, x.dtype, outputValues),\n backend.makeTensorInfo([indices.length, 'int32', indices],\n);\n];\n}\n\nexport const uniqueConfig: KernelConfig = {\n kernelName: Unique,\n backendName: 'webgl',\n kernelFunc: unique as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\nexport function unpack(\n args: {\n inputs: UnpackInputs, backend: MathBackendWebGL, attrs: UnpackAttrs\n }):\n TensorInfo[] {\n const { inputs, backend, attrs } = args;\n const { value } = inputs;\n let { axis } = attrs;\n\n if (axis < 0) {\n axis += value.shape.length;\n }\n\n const x = value;\n const xRank = x.shape.length;\n const num = value.shape[axis];\n const outShape: number[] = new Array(xRank - 1);\n let outIndex = 0;\n for (let i = 0; i < xRank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = x.shape[i];\n }\n }\n\n const toDispose = [];\n const begin = new Array(xRank).fill(0);\n const size = x.shape.slice();\n size[axis] = 1;\n const res: TensorInfo[] = new Array(num);\n for (let i = 0; i < res.length; i++) {\n begin[axis] = i;\n const sliced = slice({ inputs: { x }, backend, attrs: { begin, size } });\n const reshaped =\n reshape({ inputs: { x: sliced }, backend, attrs: { shape:
```

```

outShape});\n res[i] = reshaped;\n\n toDispose.push(sliced);\n }\n\n toDispose.forEach(t =>
backend.disposeIntermediateTensorInfo(t));\n return res;\n}\n\nexport const unpackConfig: KernelConfig = {\n
kernelName: Unpack,\n backendName: 'webgl',\n kernelFunc: unpack as {} as KernelFunc\n};\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class SegmentOpProgram implements GPGPUProgram {\n variableNames = ['x',
'segmentIds'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n segOpInfo:
backend_util.segment_util.SegOpInfo,\n segOpType: 'unsortedSegmentSum') {\n const windowSize =
segOpInfo.windowSize;\n const batchSize = segOpInfo.batchSize;\n const inSize = segOpInfo.inSize;\n const
numSegments = segOpInfo.numSegments;\n const outSize = numSegments * Math.ceil(inSize / windowSize);\n
this.outputShape = [batchSize, outSize];\n\n const initializationValue = '0.0';\n const returnValue =
`sumValue`;\n\n const windowSizeNearestVec4 = Math.floor(windowSize / 4) * 4;\n const
windowSizeVec4Remainder = windowSize % 4;\n\n const updateSnippet = `
sumValue += dot(values,
segFilter);\n `;\n\n let checkValueOutOfBounds = `;\n if (inSize % windowSize > 0) {\n
checkValueOutOfBounds = `\n if (inIdx < 0 || inIdx >= ${inSize}) {\n return initializationValue;\n }\n
`;\n }\n\n let checkSegmentIdOutOfBounds = `;\n if (inSize % windowSize > 0) {\n
checkSegmentIdOutOfBounds = `\n if (inIdx < 0 || inIdx >= ${inSize}) {\n return -1.0;\n }\n `;\n
}\n\n this.userCode = `\n const float initializationValue = ${initializationValue};\n float getValue(int
batch, int inIdx) {\n ${checkValueOutOfBounds}\n return getX(batch, inIdx);\n }\n float
getSegmentIdAtIndex(int inIdx) {\n ${checkSegmentIdOutOfBounds}\n return getSegmentIds(inIdx);\n
}\n\n void main() {\n ivec2 coords = getOutputCoords();\n int batch = coords[0];\n int outIdx =
coords[1];\n int inOffset = int(floor(float(outIdx) / float(\n ${numSegments})) * float(${windowSize}));\n
 int currentSeg = int(mod(float(outIdx), float(${numSegments})));;\n\n float sumValue = 0.0;\n\n for (int
i = 0; i < ${windowSizeNearestVec4}; i += 4) {\n int inIdx = inOffset + i;\n vec4 values = vec4(\n
getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n getValue(batch, inIdx + 2),\n
getValue(batch, inIdx + 3)\n);\n vec4 segFilter = vec4(\n int(getSegmentIdAtIndex(inIdx)) ==
currentSeg ? 1 : 0,\n int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n
int(getSegmentIdAtIndex(inIdx + 2)) == currentSeg ? 1 : 0,\n int(getSegmentIdAtIndex(inIdx + 3)) ==
currentSeg ? 1 : 0\n);\n ${updateSnippet}\n }\n int inIdx = inOffset +
${windowSizeNearestVec4};\n if (${windowSizeVec4Remainder} === 1) {\n vec4 values = vec4(\n
getValue(batch, inIdx),\n initializationValue,\n initializationValue,\n initializationValue\n
);\n int inIdxSeg = int(getSegmentIdAtIndex(inIdx));\n vec4 segFilter = vec4(\n
int(getSegmentIdAtIndex(inIdx)) == currentSeg ? 1 : 0,\n 0,\n 0,\n 0\n);\n
${updateSnippet}\n } else if (${windowSizeVec4Remainder} === 2) {\n vec4 values = vec4(\n
getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n initializationValue,\n
initializationValue\n);\n vec4 segFilter = vec4(\n int(getSegmentIdAtIndex(inIdx)) ==
currentSeg ? 1 : 0,\n int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n 0,\n 0\n
);\n ${updateSnippet}\n } else if (${windowSizeVec4Remainder} === 3) {\n vec4 values =
vec4(\n getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n getValue(batch, inIdx + 2),\n
initializationValue\n);\n vec4 segFilter = vec4(\n int(getSegmentIdAtIndex(inIdx)) ==
currentSeg ? 1 : 0,\n int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n 0,\n 0\n
);\n ${updateSnippet}\n } else if (${windowSizeVec4Remainder} === 0) {\n vec4 values =
vec4(\n getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n getValue(batch, inIdx + 2),\n
initializationValue\n);\n vec4 segFilter = vec4(\n int(getSegmentIdAtIndex(inIdx)) ==
currentSeg ? 1 : 0,\n int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n int(getSegmentIdAtIndex(inIdx + 2)) == currentSeg ? 1 : 0,\n 0\n);\n ${updateSnippet}\n
}

```

} \n     setOutput(\${returnValue}); \n     } \n     } \n } \n } \n", "/\* \n \* @license \n \* Copyright 2020 Google LLC. All Rights Reserved. \n \* Licensed under the Apache License, Version 2.0 (the "License"); \n \* you may not use this file except in compliance with the License. \n \* You may obtain a copy of the License at \n \* \n \* http://www.apache.org/licenses/LICENSE-2.0 \n \* \n \* Unless required by applicable law or agreed to in writing, software \n \* distributed under the License is distributed on an "AS IS" BASIS, \n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n \* See the License for the specific language governing permissions and \n \* limitations under the License. \n \*

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=====\n
*/\n\nimport {backend_util, DataType, KernelConfig, KernelFunc, sumOutType, TensorInfo,
UnsortedSegmentSum, UnsortedSegmentSumAttrs, UnsortedSegmentSumInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {SegmentOpProgram} from
'./segment_gpu';\nimport {range} from './Range';\nimport {reshape} from './Reshape';\nimport {tile} from
'./Tile';\nimport {transpose} from './Transpose';\n\nexport function unsortedSegmentSum(args: {\n inputs:
UnsortedSegmentSumInputs,\n backend: MathBackendWebGL,\n attrs: UnsortedSegmentSumAttrs\n}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x, segmentIds} = inputs;\n const {numSegments} =
attrs;\n\n const xRank = x.shape.length;\n\n const toDispose = [];\n\n let axis = 0;\n const permutation =
backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX
= transpose({inputs: {x}, backend, attrs: {perm: permutation}});\n toDispose.push(permutedX);\n axis =
backend_util.getInnerMostAxes(1, xRank)[0];\n }\n\n const outShape =
backend_util.segment_util.computeOutShape(\n permutedX.shape, axis, numSegments);\n const inSize =
util.sizeFromShape([permutedX.shape[axis]]);\n const a2D =\n reshape({inputs: {x: permutedX}, backend, attrs:
{shape: [-1, inSize]}});\n toDispose.push(a2D);\n\n const outputDType = sumOutType(x.dtype);\n const
segOpCompute =\n (x: TensorInfo, segOpType: 'unsortedSegmentSum', segmentIds: TensorInfo,\n dtype:
DataType, numSegments: number): TensorInfo => {\n const batchSize = x.shape[0];\n const inSize =
x.shape[1];\n const windowSize =\n backend_util.segment_util.segOpComputeOptimalWindowSize(\n
inSize, numSegments);\n const segOpInfo = {windowSize, inSize, batchSize, numSegments};\n
const program = new SegmentOpProgram(segOpInfo, segOpType);\n const output =
backend.compileAndRun(program, [x, segmentIds], dtype);\n toDispose.push(output);\n // No need to run
another GPGPU program.\n if (output.shape[1] === numSegments) {\n return output;\n }\n const
rangeInfo = range({\n backend,\n attrs: {start: 0, stop: numSegments, step: 1, dtype: 'float32'}\n });\n\n
const tileInfo = tile({\n inputs: {x: rangeInfo},\n backend,\n attrs: {reps: [inSize /
windowSize]}\n });\n\n toDispose.push(rangeInfo);\n toDispose.push(tileInfo);\n\n const result =\n segOpCompute(output, segOpType, tileInfo, dtype, numSegments);\n return result;\n }; \n\n const
segOpResult = segOpCompute(\n a2D, 'unsortedSegmentSum', segmentIds, outputDType, numSegments);\n\n
const reshaped =\n reshape({inputs: {x: segOpResult}, backend, attrs: {shape: outShape}});\n\n let result =
reshaped;\n if (permutation !== null) {\n toDispose.push(reshaped);\n const perm =
backend_util.getUndoAxesPermutation(permutation);\n result = transpose({inputs: {x: result}, backend, attrs:
{perm}});\n }\n\n toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n return
result;\n }\n\n\nexport const unsortedSegmentSumConfig: KernelConfig = {\n kernelName: UnsortedSegmentSum,\n
backendName: 'webgl',\n kernelFunc: unsortedSegmentSum as {} as KernelFunc\n}; \n", "/* \n * @license \n *
Copyright 2020 Google LLC. All Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the
"License"); \n * you may not use this file except in compliance with the License. \n * You may obtain a copy of the
License at \n * \n * http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or
agreed to in writing, software \n * distributed under the License is distributed on an "AS IS" BASIS, \n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for
the specific language governing permissions and \n * limitations under the License. \n *
```

```
=====\n
*/\n\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {_fusedMatMulConfig} from
```



```

./kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {acosConfig} from
./kernels/Acos';\nimport {acoshConfig} from './kernels/Acosh';\nimport {addConfig} from './kernels/Add';\nimport
{addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from
./kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {argMinConfig} from
./kernels/ArgMin';\nimport {asinConfig} from './kernels/Asin';\nimport {asinhConfig} from
./kernels/Asinh';\nimport {atanConfig} from './kernels/Atan';\nimport {atan2Config} from
./kernels/Atan2';\nimport {atanhConfig} from './kernels/Atanh';\nimport {avgPoolConfig} from
./kernels/AvgPool';\nimport {avgPool3DConfig} from './kernels/AvgPool3D';\nimport {avgPoolGrad3DConfig}
from './kernels/AvgPool3DGrad';\nimport {avgPoolGradConfig} from './kernels/AvgPoolGrad';\nimport
{batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchNormConfig} from
./kernels/BatchNorm';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport
{bincountConfig} from './kernels/Bincount';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from
./kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {complexConfig} from
./kernels/Complex';\nimport {complexAbsConfig} from './kernels/ComplexAbs';\nimport {concatConfig} from
./kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropFilterConfig} from
./kernels/Conv2DBackpropFilter';\nimport {conv2DBackpropInputConfig} from
./kernels/Conv2DBackpropInput';\nimport {conv3DConfig} from './kernels/Conv3D';\nimport
{conv3DBackpropFilterV2Config} from './kernels/Conv3DBackpropFilterV2';\nimport
{conv3DBackpropInputConfig} from './kernels/Conv3DBackpropInputV2';\nimport {cosConfig} from
./kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from
./kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {denseBincountConfig}
from './kernels/DenseBincount';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport
{depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport
{depthwiseConv2dNativeBackpropFilterConfig} from './kernels/DepthwiseConv2dNativeBackpropFilter';\nimport
{depthwiseConv2dNativeBackpropInputConfig} from './kernels/DepthwiseConv2dNativeBackpropInput';\nimport
{diagConfig} from './kernels/Diag';\nimport {dilation2DConfig} from './kernels/Dilation2D';\nimport {eluConfig}
from './kernels/Elu';\nimport {eluGradConfig} from './kernels/EluGrad';\nimport {equalConfig} from
./kernels/Equal';\nimport {erfConfig} from './kernels/Erf';\nimport {expConfig} from './kernels/Exp';\nimport
{expandDimsConfig} from './kernels/ExpandDims';\nimport {expm1Config} from './kernels/Expm1';\nimport
{fftConfig} from './kernels/FFT';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
./kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
./kernels/FloorDiv';\nimport {fromPixelsConfig} from './kernels/FromPixels';\nimport {fusedConv2DConfig} from
./kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
./kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{ifftConfig} from './kernels/IFFT';\nimport {imagConfig} from './kernels/Imag';\nimport {isFiniteConfig} from
./kernels/IsFinite';\nimport {isInfConfig} from './kernels/IsInf';\nimport {isNaNConfig} from
./kernels/IsNaN';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from
./kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {linSpaceConfig} from
./kernels/LinSpace';\nimport {logConfig} from './kernels/Log';\nimport {log1pConfig} from
./kernels/Log1p';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {logicalNotConfig} from
./kernels/LogicalNot';\nimport {logicalOrConfig} from './kernels/LogicalOr';\nimport {LRNConfig} from
./kernels/LRN';\nimport {LRNGradConfig} from './kernels/LRNGrad';\nimport {maxConfig} from
./kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from
./kernels/MaxPool';\nimport {maxPool3DConfig} from './kernels/MaxPool3D';\nimport {maxPoolGrad3DConfig}
from './kernels/MaxPool3DGrad';\nimport {maxPoolGradConfig} from './kernels/MaxPoolGrad';\nimport
{maxPoolWithArgmaxConfig} from './kernels/MaxPoolWithArgmax';\nimport {meanConfig} from

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./kernels/Mean';\nimport { minConfig } from './kernels/Min';\nimport { minimumConfig } from
./kernels/Minimum';\nimport { mirrorPadConfig } from './kernels/MirrorPad';\nimport { modConfig } from
./kernels/Mod';\nimport { multinomialConfig } from './kernels/Multinomial';\nimport { multiplyConfig } from
./kernels/Multiply';\nimport { negConfig } from './kernels/Neg';\nimport { nonMaxSuppressionV3Config } from
./kernels/NonMaxSuppressionV3';\nimport { nonMaxSuppressionV4Config } from
./kernels/NonMaxSuppressionV4';\nimport { nonMaxSuppressionV5Config } from
./kernels/NonMaxSuppressionV5';\nimport { notEqualConfig } from './kernels/NotEqual';\nimport { oneHotConfig }
from './kernels/OneHot';\nimport { onesLikeConfig } from './kernels/OnesLike';\nimport { packConfig } from
./kernels/Pack';\nimport { padV2Config } from './kernels/PadV2';\nimport { powConfig } from
./kernels/Pow';\nimport { preluConfig } from './kernels/Prelu';\nimport { prodConfig } from './kernels/Prod';\nimport
{ rangeConfig } from './kernels/Range';\nimport { realConfig } from './kernels/Real';\nimport { realDivConfig } from
./kernels/RealDiv';\nimport { reciprocalConfig } from './kernels/Reciprocal';\nimport { reluConfig } from
./kernels/Relu';\nimport { relu6Config } from './kernels/Relu6';\nimport { reshapeConfig } from
./kernels/Reshape';\nimport { resizeBilinearConfig } from './kernels/ResizeBilinear';\nimport
{ resizeBilinearGradConfig } from './kernels/ResizeBilinearGrad';\nimport { resizeNearestNeighborConfig } from
./kernels/ResizeNearestNeighbor';\nimport { resizeNearestNeighborGradConfig } from
./kernels/ResizeNearestNeighborGrad';\nimport { reverseConfig } from './kernels/Reverse';\nimport
{ rotateWithOffsetConfig } from './kernels/RotateWithOffset';\nimport { roundConfig } from
./kernels/Round';\nimport { rsqrtConfig } from './kernels/Rsqrt';\nimport { scatterNdConfig } from
./kernels/ScatterNd';\nimport { selectConfig } from './kernels/Select';\nimport { seluConfig } from
./kernels/Selu';\nimport { sigmoidConfig } from './kernels/Sigmoid';\nimport { signConfig } from
./kernels/Sign';\nimport { sinConfig } from './kernels/Sin';\nimport { sinhConfig } from './kernels/Sinh';\nimport
{ sliceConfig } from './kernels/Slice';\nimport { softmaxConfig } from './kernels/Softmax';\nimport { softplusConfig }
from './kernels/Softplus';\nimport { spaceToBatchNDConfig } from './kernels/SpaceToBatchND';\nimport
{ sparseToDenseConfig } from './kernels/SparseToDense';\nimport { splitVConfig } from './kernels/SplitV';\nimport
{ sqrtConfig } from './kernels/Sqrt';\nimport { squareConfig } from './kernels/Square';\nimport
{ squaredDifferenceConfig } from './kernels/SquaredDifference';\nimport { stepConfig } from './kernels/Step';\nimport
{ stridedSliceConfig } from './kernels/StridedSlice';\nimport { subConfig } from './kernels/Sub';\nimport { sumConfig }
from './kernels/Sum';\nimport { tanConfig } from './kernels/Tan';\nimport { tanhConfig } from './kernels/Tanh';\nimport
{ tileConfig } from './kernels/Tile';\nimport { topKConfig } from './kernels/TopK';\nimport { transposeConfig } from
./kernels/Transpose';\nimport { uniqueConfig } from './kernels/Unique';\nimport { unpackConfig } from
./kernels/Unpack';\nimport { unsortedSegmentSumConfig } from './kernels/UnsortedSegmentSum';\nimport
{ zerosLikeConfig } from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst kernelConfigs:
KernelConfig[] = [\n LRNConfig,\n LRNGradConfig,\n _fusedMatMulConfig,\n absConfig,\n acosConfig,\n acoshConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n argMinConfig,\n asinConfig,\n asinhConfig,\n atan2Config,\n atanConfig,\n atanhConfig,\n avgPool3DConfig,\n avgPoolConfig,\n avgPoolGrad3DConfig,\n avgPoolGradConfig,\n batchMatMulConfig,\n batchNormConfig,\n batchToSpaceNDConfig,\n bincountConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n complexAbsConfig,\n complexConfig,\n concatConfig,\n conv2DBackpropFilterConfig,\n conv2DBackpropInputConfig,\n conv2DConfig,\n conv3DBackpropFilterV2Config,\n conv3DBackpropInputConfig,\n conv3DConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n denseBincountConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeBackpropFilterConfig,\n depthwiseConv2dNativeBackpropInputConfig,\n depthwiseConv2dNativeConfig,\n diagConfig,\n dilation2DConfig,\n eluConfig,\n eluGradConfig,\n equalConfig,\n erfConfig,\n expConfig,\n expandDimsConfig,\n expm1Config,\n fftConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fromPixelsConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n ifftConfig,\n imagConfig,\n isFiniteConfig,\n isInfConfig,\n isNaNConfig,\n

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leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n linSpaceConfig,\n log1pConfig,\n logConfig,\n
logicalAndConfig,\n logicalNotConfig,\n logicalOrConfig,\n maxConfig,\n maxPool3DConfig,\n
maxPoolConfig,\n maxPoolGrad3DConfig,\n maxPoolGradConfig,\n maxPoolWithArgmaxConfig,\n
maximumConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n modConfig,\n
multinomialConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n
nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n
onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n
realConfig,\n realDivConfig,\n reciprocalConfig,\n relu6Config,\n reluConfig,\n reshapeConfig,\n
resizeBilinearConfig,\n resizeBilinearGradConfig,\n resizeNearestNeighborConfig,\n
resizeNearestNeighborGradConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n roundConfig,\n rsqrtConfig,\n
scatterNdConfig,\n selectConfig,\n seluConfig,\n sigmoidConfig,\n signConfig,\n sinConfig,\n sinhConfig,\n
sliceConfig,\n softmaxConfig,\n softplusConfig,\n spaceToBatchNDConfig,\n sparseToDenseConfig,\n
splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n
subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transposeConfig,\n
uniqueConfig,\n unpackConfig,\n unsortedSegmentSumConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig
of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n",\n\n**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n * \n *

```

```

=====\n
*\n\n/ * tslint:disable *\n\n/ ** Properties of an Any. *\n\nexport declare interface IAny {\n / ** Any typeUrl */\n
typeUrl?: (string|null);\n\n / ** Any value */\n value?: (Uint8Array|null);\n}\n\n/ ** DataType enum. *\n\nexport
enum DataType {\n 'DT_INVALID' = 0,\n 'DT_FLOAT' = 1,\n 'DT_DOUBLE' = 2,\n 'DT_INT32' = 3,\n
'DT_UINT8' = 4,\n 'DT_INT16' = 5,\n 'DT_INT8' = 6,\n 'DT_STRING' = 7,\n 'DT_COMPLEX64' = 8,\n
'DT_INT64' = 9,\n 'DT_BOOL' = 10,\n 'DT_QINT8' = 11,\n 'DT_QUINT8' = 12,\n 'DT_QINT32' = 13,\n
'DT_BFLOAT16' = 14,\n 'DT_FLOAT_REF' = 101,\n 'DT_DOUBLE_REF' = 102,\n 'DT_INT32_REF' = 103,\n
'DT_UINT8_REF' = 104,\n 'DT_INT16_REF' = 105,\n 'DT_INT8_REF' = 106,\n 'DT_STRING_REF' = 107,\n
'DT_COMPLEX64_REF' = 108,\n 'DT_INT64_REF' = 109,\n 'DT_BOOL_REF' = 110,\n 'DT_QINT8_REF' =
111,\n 'DT_QUINT8_REF' = 112,\n 'DT_QINT32_REF' = 113,\n 'DT_BFLOAT16_REF' = 114\n}\n\n/ **
Properties of a TensorShape. *\n\nexport declare interface ITensorShape {\n / ** TensorShape dim */\n dim?:
(TensorShape.IDim[]|null);\n\n / ** TensorShape unknownRank */\n unknownRank?: (boolean|null);\n}\n\nexport
namespace TensorShape {\n / ** Properties of a Dim. */\n\n export declare interface IDim {\n / ** Dim size */\n
size?: (number|string|null);\n\n / ** Dim name */\n name?: (string|null);\n }\n}\n\n/ ** Properties of a Tensor.
*\n\nexport declare interface ITensor {\n / ** Tensor dtype */\n dtype?: (DataType|null);\n\n / ** Tensor tensorShape
*/\n tensorShape?: (ITensorShape|null);\n\n / ** Tensor versionNumber */\n versionNumber?: (number|null);\n\n
/ ** Tensor tensorContent */\n tensorContent?: (Uint8Array|null);\n\n / ** Tensor floatVal */\n floatVal?:
(number[]|null);\n\n / ** Tensor doubleVal */\n doubleVal?: (number[]|null);\n\n / ** Tensor intVal */\n intVal?:
(number[]|null);\n\n / ** Tensor stringVal */\n stringVal?: (Uint8Array[]|null);\n\n / ** Tensor scomplexVal */\n
scomplexVal?: (number[]|null);\n\n / ** Tensor int64Val */\n int64Val?: ((number | string)[]|null);\n\n / ** Tensor
boolVal */\n boolVal?: (boolean[]|null);\n\n / ** Tensor uint32Val */\n uint32Val?: (number[]|null);\n\n / **
Tensor uint64Val */\n uint64Val?: ((number | string)[]|null);\n}\n\n/ ** Properties of an AttrValue. *\n\nexport
declare interface IAttrValue {\n / ** AttrValue list */\n list?: (AttrValue.IListValue|null);\n\n / ** AttrValue s */\n
s?: (string|null);\n\n / ** AttrValue i */\n i?: (number|string|null);\n\n / ** AttrValue f */\n f?: (number|null);\n\n
/ ** AttrValue b */\n b?: (boolean|null);\n\n / ** AttrValue type */\n type?: (DataType|null);\n\n / ** AttrValue
shape */\n shape?: (ITensorShape|null);\n\n / ** AttrValue tensor */\n tensor?: (ITensor|null);\n\n / ** AttrValue

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placeholder */\n placeholder?: (string|null);\n\n /** AttrValue func */\n func?: (INameAttrList|null);\n}\n\nexport
namespace AttrValue {\n /** Properties of a ListValue. */\n export declare interface IListValue {\n /** ListValue
s */\n s?: (string[]|null);\n\n /** ListValue i */\n i?: ((number | string)|[]|null);\n\n /** ListValue f */\n f?:
(number[]|null);\n\n /** ListValue b */\n b?: (boolean[]|null);\n\n /** ListValue type */\n type?:
(DataType[]|null);\n\n /** ListValue shape */\n shape?: (ITensorShape[]|null);\n\n /** ListValue tensor */\n
tensor?: (ITensor[]|null);\n\n /** ListValue func */\n func?: (INameAttrList[]|null);\n }\n}\n\n/** Properties of a
NameAttrList. */\nexport declare interface INameAttrList {\n /** NameAttrList name */\n name?: (string|null);\n\n
/** NameAttrList attr */\n attr?: ({[k: string]: IAttrValue}|null);\n }\n}\n\n/** Properties of a NodeDef. */\nexport
declare interface INodeDef {\n /** NodeDef name */\n name?: (string|null);\n\n /** NodeDef op */\n op?:
(string|null);\n\n /** NodeDef input */\n input?: (string[]|null);\n\n /** NodeDef device */\n device?:
(string|null);\n\n /** NodeDef attr */\n attr?: ({[k: string]: IAttrValue}|null);\n }\n}\n\n/** Properties of a VersionDef.
*/\nexport declare interface IVersionDef {\n /** VersionDef producer */\n producer?: (number|null);\n\n /**
VersionDef minConsumer */\n minConsumer?: (number|null);\n\n /** VersionDef badConsumers */\n
badConsumers?: (number[]|null);\n }\n}\n\n/** Properties of a GraphDef. */\nexport declare interface IGraphDef {\n
/** GraphDef node */\n node?: (INodeDef[]|null);\n\n /** GraphDef versions */\n versions?:
(IVersionDef[]|null);\n\n /** GraphDef library */\n library?: (IFunctionDefLibrary|null);\n }\n}\n\n/** Properties of a
CollectionDef. */\nexport declare interface ICollectionDef {\n /** CollectionDef nodeList */\n nodeList?:
(CollectionDef.INodeList|null);\n\n /** CollectionDef bytesList */\n bytesList?:
(CollectionDef.IBytesList|null);\n\n /** CollectionDef int64List */\n int64List?:
(CollectionDef.IInt64List|null);\n\n /** CollectionDef floatList */\n floatList?: (CollectionDef.IFloatList|null);\n\n
/** CollectionDef anyList */\n anyList?: (CollectionDef.IAnyList|null);\n }\n}\n\nexport namespace CollectionDef {\n
/** Properties of a NodeList. */\n export declare interface INodeList {\n /** NodeList value */\n value?:
(string[]|null);\n }\n}\n\n /** Properties of a BytesList. */\n export declare interface IBytesList {\n /** BytesList
value */\n value?: (Uint8Array[]|null);\n }\n}\n\n /** Properties of an Int64List. */\n export declare interface
IInt64List {\n /** Int64List value */\n value?: ((number | string)|[]|null);\n }\n}\n\n /** Properties of a FloatList.
*/\n export declare interface IFloatList {\n /** FloatList value */\n value?: (number[]|null);\n }\n}\n\n /**
Properties of an AnyList. */\n export declare interface IAnyList {\n /** AnyList value */\n value?:
(IAny[]|null);\n }\n}\n\n /** Properties of a SaverDef. */\nexport declare interface ISaverDef {\n /** SaverDef
filenameTensorName */\n filenameTensorName?: (string|null);\n\n /** SaverDef saveTensorName */\n
saveTensorName?: (string|null);\n\n /** SaverDef restoreOpName */\n restoreOpName?: (string|null);\n\n /**
SaverDef maxToKeep */\n maxToKeep?: (number|null);\n\n /** SaverDef sharded */\n sharded?:
(boolean|null);\n\n /** SaverDef keepCheckpointEveryNHours */\n keepCheckpointEveryNHours?:
(number|null);\n\n /** SaverDef version */\n version?: (SaverDef.CheckpointFormatVersion|null);\n }\n}\n\nexport
namespace SaverDef {\n /** CheckpointFormatVersion enum. */\n export enum CheckpointFormatVersion
{'LEGACY' = 0, 'V1' = 1, 'V2' = 2}\n}\n}\n\n /** Properties of a TensorInfo. */\nexport declare interface ITensorInfo
{\n /** TensorInfo name */\n name?: (string|null);\n\n /** TensorInfo cooSparse */\n cooSparse?:
(TensorInfo.ICooSparse|null);\n\n /** TensorInfo dtype */\n dtype?: (DataType|null);\n\n /** TensorInfo
tensorShape */\n tensorShape?: (ITensorShape|null);\n }\n}\n\nexport namespace TensorInfo {\n /** Properties of a
CooSparse. */\n export declare interface ICooSparse {\n /** CooSparse valuesTensorName */\n
valuesTensorName?: (string|null);\n\n /** CooSparse indicesTensorName */\n indicesTensorName?:
(string|null);\n\n /** CooSparse denseShapeTensorName */\n denseShapeTensorName?: (string|null);\n
}\n}\n}\n\n /** Properties of a SignatureDef. */\nexport declare interface ISignatureDef {\n /** SignatureDef inputs
*/\n inputs?: ({[k: string]: ITensorInfo}|null);\n\n /** SignatureDef outputs */\n outputs?: ({[k: string]:
ITensorInfo}|null);\n\n /** SignatureDef methodName */\n methodName?: (string|null);\n }\n}\n\n /** Properties of an
AssetFileDef. */\nexport declare interface IAssetFileDef {\n /** AssetFileDef tensorInfo */\n tensorInfo?:
(ITensorInfo|null);\n\n /** AssetFileDef filename */\n filename?: (string|null);\n }\n}\n\n /** Properties of an OpDef.
*/\nexport declare interface IOpDef {\n /** OpDef name */\n name?: (string|null);\n\n /** OpDef inputArg */\n
inputArg?: (OpDef.IArgDef[]|null);\n\n /** OpDef outputArg */\n outputArg?: (OpDef.IArgDef[]|null);\n }\n}\n\n /**

```



```

= (node) =>\n * tf.matMul(\n * node.inputs[0], node.inputs[1],\n * node.attrs['transpose_a'],
node.attrs['transpose_b']);\n * \n * tf.registerOp('MatMul', customMatmul);\n * ``\n * The inputs and attrs of the
node object is based on the TensorFlow op\n * registry.\n * \n * @param name The Tensorflow Op name.\n *
@param opFunc An op function which is called with the current graph node\n * during execution and needs to
return a tensor or a list of tensors. The node\n * has the following attributes:\n * - attr: A map from attribute name
to its value\n * - inputs: A list of input tensors\n * \n * @doc {heading: 'Models', subheading: 'Op Registry'}\n
*\n * export function registerOp(name: string, opFunc: OpExecutor) {\n * const opMapper: OpMapper = {\n *
tfOpName: name,\n * category: 'custom',\n * inputs: [],\n * attrs: [],\n * customExecutor: opFunc\n *};\n *
CUSTOM_OPS[name] = opMapper;\n *}\n * \n * Retrieve the OpMapper object for the registered op.\n * \n *
@param name The Tensorflow Op name.\n * \n * @doc {heading: 'Models', subheading: 'Op Registry'}\n * \n *
export function getRegisteredOp(name: string): OpMapper {\n * return CUSTOM_OPS[name];\n *}\n * \n * Deregister the
Op for graph model executor.\n * \n * @param name The Tensorflow Op name.\n * \n * @doc {heading: 'Models',
subheading: 'Op Registry'}\n * \n * export function deregisterOp(name: string) {\n * delete
CUSTOM_OPS[name];\n *}\n * \n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n * import {clone, Tensor, util} from '@tensorflow/tfjs-core';\n * import {NamedTensorsMap} from
'../data/types';\n * import {ExecutionContext} from '../executor/execution_context';\n * import {ResourceManager}
from '../executor/resource_manager';\n * import {Node, ValueType} from './types';\n * \n * export function
getParamValue(\n * paramName: string, node: Node, tensorMap: NamedTensorsMap,\n * context:
ExecutionContext, resourceManager?: ResourceManager): ValueType {\n * const inputParam =
node.inputParams[paramName];\n * if (inputParam && inputParam.inputIndexStart !== undefined) {\n * const start
= inputParam.inputIndexStart;\n * const end = inputParam.inputIndexEnd === 0 ?\n * undefined :
(inputParam.inputIndexEnd === undefined ? start + 1 :\n * inputParam.inputIndexEnd);\n * if (inputParam.type === 'tensor') {\n * return getTensor(\n *
node.inputNames[inputParam.inputIndexStart], tensorMap, context,\n * resourceManager);\n * }\n * if
(inputParam.type === 'tensors') {\n * const inputs = node.inputNames.slice(start, end);\n * \n * return inputs.map(\n *
name => getTensor(name, tensorMap, context, resourceManager));\n * }\n * const tensor = getTensor(\n *
node.inputNames.slice(start)[0], tensorMap, context, resourceManager);\n * const data = tensor.dataSync();\n *
return inputParam.type === 'number' ?\n * data[0] : util.toNestedArray(tensor.shape, data);\n * }\n * const
attrParam = node.attrParams[paramName];\n * return attrParam && attrParam.value;\n *}\n * \n * Retrieve the
tensor from tensorsMap based on input name.\n * \n * @param name Node input name\n * \n * @param tensorsMap Tensors
map keyed by the node\n * \n * @param context contains tensors and information for running the current node.\n *
@param resourceManager Optional. Contains global resources of the model.\n * \n * export function getTensor(\n *
name: string, tensorsMap: NamedTensorsMap, context: ExecutionContext,\n * resourceManager?:
ResourceManager): Tensor {\n * const [nodeName, index] = parseNodeName(name);\n * \n * if (resourceManager !==
null) {\n * const tensor = resourceManager.getHashTableHandleByName(nodeName);\n * if (tensor !== null) {\n *
return tensor;\n * }\n * }\n * \n * const contextId = context.currentContextIds.find(contextId => {\n * return
!!tensorsMap[getNodeNameWithContextId(nodeName, contextId)];\n * });\n * \n * return contextId !== undefined ?\n *
tensorsMap[getNodeNameWithContextId(nodeName, contextId)][index] :
undefined;\n *}\n * \n * Retrieve the tensors based on input name for current context.\n * \n * @param name Node input name\n * \n * @param tensorsMap
Tensors map keyed by the node\n * \n * export function getTensorsForCurrentContentxt(\n * name: string, tensorsMap:
NamedTensorsMap,\n * context: ExecutionContext): Tensor[] {\n * return

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tensorsMap[getNodeNameWithContextId(name, context.currentContextId)];\n\n/**\n * Returns the node name
and index from the Node input name.\n * @param inputName The input name of the node, in format of\n *
node_name:output_index, i.e. MatMul:0, if the output_index is not set, it is\n * default to 0.\n */\nexport function
getNodeNameAndIndex(\n inputName: string, context?: ExecutionContext): [string, number] {\n const
[nodeName, index] = parseNodeName(inputName);\n\n return [\n getNodeNameWithContextId(nodeName,
context && context.currentContextId),\n index\n];\n}\n\nfunction getNodeNameWithContextId(name: string,
contextId?: string): string {\n return `!contextId ? `${name}-${contextId}` : name;\n}\n\nexport function
parseNodeName(name: string): [string, number] {\n const parts = name.split(':');\n if (parts.length === 1) {\n
return [name, 0];\n }\n\n const nodeName = parts[0];\n return [nodeName, Number(parts[parts.length -
1])];\n}\n\nexport function split(arr: number[], size: number) {\n const res = [];\n for (let i = 0; i < arr.length; i +=
size) {\n res.push(arr.slice(i, i + size));\n }\n return res;\n}\n\nexport function getPadding(\n node: Node,
tensorMap: NamedTensorsMap,\n context: ExecutionContext): ValueType {\n let pad = getParamValue('pad',
node, tensorMap, context);\n if (pad === 'explicit') {\n // This is 1d array, we need to convert it to 2d array\n
pad = getParamValue('explicitPaddings', node, tensorMap, context);\n const explicitPadding: [\n [number,
number], [number, number], [number, number], [number, number]\n] = [[0, 0], [0, 0], [0, 0], [0, 0]];
for (let i = 0; i < 4; i++) {\n explicitPadding[i][0] = (pad as number[])[i * 2];\n explicitPadding[i][1] = (pad as
number[])[i * 2 + 1];\n }\n return explicitPadding;\n }\n return pad;\n}\n\n/**\n * Reuse the tensor if it is
marked as keep, otherwise clone the tensor to\n * avoid disposal. This is important for TensorArray and TensorList
ops, since\n * internally they use a tensor as the id for TensorArray and TensorList, and\n * to simplify lookup, they
also use Tensor.id as the key to the internal map.\n * These id tensors have been marked as kept in the backend, we
need avoid clone\n * them in order to create new Tensor.id.\n */\nexport function
cloneTensor(tensor: Tensor): Tensor {\n return tensor.kept ? tensor : clone(tensor);\n}\n\n"/**\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Add',\n
'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type':
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 {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype',
'notSupported': true}\n]\n },\n {\n 'tfOpName': 'AddN',\n 'category': 'arithmetic',\n 'inputs': [{start: 0, 'end':
0, 'name': 'tensors', 'type': 'tensors'}]\n },\n {\n 'tfOpName': 'BiasAdd',\n 'category': 'arithmetic',\n 'inputs': [\n
 {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName':
'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true},\n {'tfName': 'data_format', 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Sub',\n 'category': 'arithmetic',\n
'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n
 {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'RealDiv',\n
'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type':
'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n
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'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'FloorDiv',\n 'category': 'arithmetic',\n 'inputs': [\n

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{'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T',\n 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Mul',\n 'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Maximum',\n 'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'}\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Minimum',\n 'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'}\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Pow',\n 'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'SquaredDifference',\n 'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Mod',\n 'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'FloorMod',\n 'category': 'arithmetic',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }]\n }];\n";\n\nimport {OpMapper} from './types';\n\n**\n * @license\n * Copyright 2018\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n *\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Abs',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Acos',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Asin',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Atan',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Atan2',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'y', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Ceil',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'ClipByValue',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'clipValueMin', 'type': 'number'},\n {'start': 2, 'name': 'clipValueMax', 'type': 'number'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Complex',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'real', 'type': 'tensor'},\n {'start': 1, 'name': 'imag', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'ComplexAbs',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Cos',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Cosh',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Elu',\n 'category':
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'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Asinh',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Acosh',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Atanh',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Erf',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Prod',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axes', 'type': 'number[]'},\n],\n 'attrs': [\n {\n 'tfName': 'keep_dims',\n 'name': 'keepDims',\n 'type': 'bool',\n 'notSupported': true\n },\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'LeakyRelu',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'alpha',\n 'name': 'alpha',\n 'type': 'number',\n 'defaultValue': 0.2\n },\n {\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }\n]\n };\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {OpMapper} from './types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'EmptyTensorList',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'elementShape', 'type': 'shape'},\n {'start': 1, 'name': 'maxNumElements', 'type': 'number'},\n],\n 'attrs': [\n [{'tfName': 'element_dtype', 'name': 'elementDType', 'type': 'dtype'}]\n],\n 'tfOpName': 'LoopCond',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'pred', 'type': 'tensor'}\n],\n 'tfOpName': 'Switch',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'data', 'type': 'tensor'},\n {'start': 1, 'name': 'pred', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'Merge',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'end': 0, 'name': 'tensors', 'type': 'tensors'}\n],\n 'tfOpName': 'Enter',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensor', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true},\n {'tfName': 'frame_name', 'name': 'frameName', 'type': 'string'},\n {'tfName': 'is_constant', 'name': 'isConstant', 'type': 'bool'}\n]\n },\n {\n 'tfOpName': 'Exit',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensor', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'NextIteration',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensor', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'TensorArrayV3',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'size', 'type': 'number'},\n],\n 'attrs': [\n {'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'},\n {'tfName': 'element_shape', 'name': 'elementShape', 'type': 'shape'},\n {'tfName': 'dynamic_size', 'name': 'dynamicSize', 'type': 'bool'},\n {'tfName': 'clear_after_read', 'name': 'clearAfterRead', 'type': 'bool'},\n {'tfName': 'identical_element_shapes', 'name': 'identicalElementShapes', 'type': 'bool'},\n {'tfName': 'tensor_array_name', 'name': 'name', 'type': 'string'}\n]\n },\n {\n 'tfOpName': 'TensorArrayWriteV3',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensorArrayId', 'type': 'tensor'},\n {'start': 1, 'name': 'index', 'type': 'number'},\n {'start': 2, 'name': 'tensor', 'type': 'tensor'},\n {'start': 3, 'name': 'flowIn', 'type': 'number'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'TensorArrayReadV3',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensorArrayId', 'type': 'tensor'},\n {'start': 1, 'name': 'index', 'type': 'number'},\n {'start': 2, 'name': 'flowIn', 'type': 'number'},\n],\n 'attrs': [\n {'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName':

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'TensorArrayGatherV3',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensorArrayId', 'type':
'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'number[]'},\n {'start': 2, 'name': 'flowIn', 'type': 'number'}],\n],\n 'attrs': [\n {'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'},\n {'tfName': 'element_shape', 'name':
'elementShape', 'type': 'shape'}],\n },\n {\n 'tfOpName': 'TensorArrayScatterV3',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensorArrayId', 'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type':
'number[]'},\n {'start': 2, 'name': 'tensor', 'type': 'tensor'},\n {'start': 3, 'name': 'flowIn', 'type': 'number'}],\n],\n 'attrs': [{'tfName': 'T', 'name': 'dtype', 'type': 'dtype'}],\n },\n {\n 'tfOpName': 'TensorArrayConcatV3',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensorArrayId', 'type': 'tensor'},\n {'start': 1, 'name':
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'type': 'number[]'},\n {'start': 3, 'name': 'flowIn', 'type': 'number'}],\n],\n 'attrs': [{'tfName': 'T', 'name': 'dtype',
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'name': 'tensorArrayId', 'type': 'tensor'},\n {'start': 1, 'name': 'flowIn', 'type': 'number'}],\n },\n },\n {\n 'tfOpName': 'TensorArrayCloseV3',\n 'category': 'control',\n 'inputs': [{'start': 0, 'name': 'tensorArrayId', 'type':
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'type': 'tensor'},\n {'start': 1, 'end': 0, 'name': 'args', 'type': 'tensors'}],\n],\n 'attrs': [\n {'tfName':
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'body', 'type': 'func'}],\n },\n {\n 'tfOpName': 'While',\n 'category': 'control',\n 'inputs': [\n {'start': 0,
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'number[]'},\n {'start': 2, 'name': 'elementShape', 'type': 'shape'}],\n],\n 'attrs': [\n {'tfName':
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'type': 'number[]'},\n {'start': 2, 'name': 'elementShape', 'type': 'shape'},\n {'start': 3, 'name': 'numElements',
'type': 'number'}],\n],\n 'attrs': [\n {'tfName': 'element_dtype', 'name': 'elementDType', 'type': 'dtype'}],\n },\n {\n 'tfOpName': 'TensorListGather',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'tensorListId',
'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'number[]'},\n {'start': 2, 'name': 'elementShape', 'type':
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```

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=====\n\n*\n\nimport {OpMapper} from '../types';\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'AvgPool',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n },\n {\n 'tfName': 'ksize',\n 'name': 'kernelSize',\n 'type': 'number[]',\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n }\n],\n {\n 'tfOpName': 'MaxPool',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n },\n {\n 'tfName': 'ksize',\n 'name': 'kernelSize',\n 'type': 'number[]',\n {\n 'tfName': 'explicit_paddings',\n 'name': 'explicitPaddings',\n 'type': 'number[]',\n 'defaultValue': [],\n 'notSupported': true\n },\n {\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }\n }\n],\n {\n 'tfOpName': 'MaxPoolWithArgmax',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName': 'ksize',\n 'name': 'kernelSize',\n 'type': 'number[]',\n {\n 'tfName': 'include_batch_in_index',\n 'name': 'includeBatchInIndex',\n 'type': 'bool',\n {\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }\n }\n }\n],\n {\n 'tfOpName': 'AvgPool3D',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n },\n {\n 'tfName': 'ksize',\n 'name': 'kernelSize',\n 'type': 'number[]',\n {\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }\n }\n],\n {\n 'tfOpName': 'MaxPool3D',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n },\n {\n 'tfName': 'ksize',\n 'name': 'kernelSize',\n 'type': 'number[]',\n {\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }\n }\n],\n {\n 'tfOpName': 'Conv1D',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'filter', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'stride', 'name': 'stride', 'type': 'number'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n
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'pad', 'type': 'string'}\n]\n }\n];\n", "import {OpMapper} from '../types';\n\n**\n * @license\n * Copyright 2018
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Fill',\n 'category': 'creation',\n 'inputs': [\n
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{OpMapper} from './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*/\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'NonMaxSuppressionV2',\n 'category': 'dynamic',\n
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}]\n }]\n};\n", "import {OpMapper} from './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights
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governing permissions and\n * limitations under the License.\n *
```

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=====\n
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{ 'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n },\n {\n 'tfOpName': 'UniqueV2',\n 'category': 'evaluation',\n
'inputs': [\n { 'start': 0, 'name': 'x', 'type': 'tensor'},\n { 'start': 1, 'name': 'axis', 'type': 'number'},\n],\n
},\n];\n", "import {OpMapper} from './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights
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except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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governing permissions and\n * limitations under the License.\n *
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OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

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*
export const json: OpMapper[] = [\n {\n 'tfOpName': 'PlaceholderWithDefault',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'default', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'shape', 'name': 'shape', 'type': 'shape'},\n {'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'}\n]\n },\n {\n 'tfOpName': 'Placeholder',\n 'category': 'graph',\n 'attrs': [\n {'tfName': 'shape', 'name': 'shape', 'type': 'shape'},\n {'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'}\n]\n },\n {\n 'tfOpName': 'Const', 'category': 'graph' },\n {\n 'tfOpName': 'Identity',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'IdentityN',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'end': 0, 'name': 'x', 'type': 'tensors'}\n]\n },\n {\n 'tfOpName': 'Snapshot',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'Rank',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'Size',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'Shape',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'ShapeN',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'end': 0, 'name': 'x', 'type': 'tensors'}\n]\n },\n {\n 'tfOpName': 'Print',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'data', 'type': 'tensors'},\n],\n 'attrs': [\n {'tfName': 'message', 'name': 'message', 'type': 'string'},\n {'tfName': 'first_n', 'name': 'firstN', 'type': 'number', 'notSupported': true},\n {'tfName': 'summarize', 'name': 'summarize', 'type': 'number', 'defaultValue': 3}\n]\n },\n {\n 'tfOpName': 'NoOp',\n 'category': 'graph',\n 'inputs': []\n },\n {\n 'tfOpName': 'StopGradient',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'FakeQuantWithMinMaxVars',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'min', 'name': 'min', 'type': 'number'},\n {'tfName': 'max', 'name': 'max', 'type': 'number'}\n]\n };\n\n/* @license Copyright 2020 Google LLC. All Rights Reserved. Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License. */
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*
import {OpMapper} from './types';
export const json: OpMapper[] = [\n {\n 'tfOpName': 'HashTable',\n 'category': 'hash_table',\n 'inputs': [],\n 'attrs': [\n {'tfName': 'shared_name', 'name': 'sharedName', 'type': 'string'},\n {'tfName': 'use_node_name_sharing', 'name': 'useNodeNameSharing', 'type': 'bool'},\n {'tfName': 'key_dtype', 'name': 'keyDType', 'type': 'dtype'},\n {'tfName': 'value_dtype', 'name': 'valueDType', 'type': 'dtype'}\n]\n },\n {\n 'tfOpName': 'HashTableV2',\n 'category': 'hash_table',\n 'inputs': [],\n 'attrs': [\n {'tfName': 'shared_name', 'name': 'sharedName', 'type': 'string'},\n {'tfName': 'use_node_name_sharing', 'name': 'useNodeNameSharing', 'type': 'bool'},\n {'tfName': 'key_dtype', 'name': 'keyDType', 'type': 'dtype'},\n {'tfName': 'value_dtype', 'name': 'valueDType', 'type': 'dtype'}\n]\n },\n {\n 'tfOpName': 'LookupTableImport',\n 'category': 'hash_table',\n 'inputs': [\n {'start': 0, 'name': 'tableHandle', 'type': 'tensor'},\n {'start': 1, 'name': 'keys', 'type': 'tensor'},\n {'start': 2, 'name': 'values', 'type': 'tensor'}\n],\n 'attrs': [\n {'tfName': 'Tin', 'name': 'tIn', 'type': 'dtype', 'notSupported': true},\n {'tfName': 'Tout', 'name': 'tOut', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'LookupTableImportV2',\n 'category': 'hash_table',\n 'inputs': [\n {'start': 0, 'name': 'tableHandle', 'type': 'tensor'},\n {'start': 1, 'name': 'keys', 'type': 'tensor'},\n {'start': 2, 'name': 'values', 'type': 'tensor'}\n],\n 'attrs': [\n {'tfName': 'Tin', 'name': 'tIn', 'type': 'dtype', 'notSupported': true},\n {'tfName': 'Tout', 'name': 'tOut', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'LookupTableFind',\n 'category': 'hash_table',\n 'inputs': [\n {'start': 0, 'name': 'tableHandle', 'type': 'tensor'},\n {'start': 1, 'name': 'keys', 'type': 'tensor'},\n {'start': 2, 'name': 'defaultValue', 'type': 'tensor'}\n],\n 'attrs': [\n {'tfName': 'Tin',
```



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'name': 'tIn', 'type': 'dtype', 'notSupported': true}, {\n 'tfName': 'Tout',\n 'name': 'tOut',\n 'type': 'dtype',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'LookupTableFindV2',\n 'category': 'hash_table',\n 'inputs': [\n {'start': 0, 'name': 'tableHandle', 'type': 'tensor'},\n {'start': 1, 'name': 'keys', 'type': 'tensor'},\n {'start': 2, 'name': 'defaultValue', 'type': 'tensor'}\n],\n 'attrs': [\n {'tfName': 'Tin', 'name': 'tIn', 'type': 'dtype',\n 'notSupported': true}, {\n 'tfName': 'Tout',\n 'name': 'tOut',\n 'type': 'dtype',\n 'notSupported': true\n }\n]\n }\n];\n\n", "import { OpMapper } from '../types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'ResizeBilinear',\n 'category': 'image',\n 'inputs': [\n {'start': 0, 'name': 'images', 'type': 'tensor'},\n {'start': 1, 'name': 'size', 'type': 'number[]'},\n],\n 'attrs': [\n {'tfName': 'align_corners', 'name': 'alignCorners', 'type': 'bool'},\n {'tfName': 'half_pixel_centers',\n 'name': 'halfPixelCenters',\n 'type': 'bool'\n },\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported':\n true\n }\n]\n },\n {\n 'tfOpName': 'ResizeNearestNeighbor',\n 'category': 'image',\n 'inputs': [\n {'start': 0, 'name': 'images', 'type': 'tensor'},\n {'start': 1, 'name': 'size', 'type': 'number[]'},\n],\n 'attrs': [\n {'tfName': 'align_corners', 'name': 'alignCorners', 'type': 'bool'},\n {'tfName': 'half_pixel_centers',\n 'name': 'halfPixelCenters',\n 'type': 'bool'\n },\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported':\n true\n }\n]\n },\n {\n 'tfOpName': 'CropAndResize',\n 'category': 'image',\n 'inputs': [\n {'start': 0, 'name': 'image', 'type': 'tensor'},\n {'start': 1, 'name': 'boxes', 'type': 'tensor'},\n {'start': 2, 'name': 'boxInd', 'type': 'tensor'},\n {'start': 3, 'name': 'cropSize', 'type': 'number[]'},\n],\n 'attrs': [\n {'tfName': 'method', 'name': 'method', 'type': 'string'},\n {'tfName': 'extrapolation_value',\n 'name': 'extrapolationValue',\n 'type': 'number'\n }\n]\n }\n];\n\n", "import { OpMapper } from '../types';\n\n/**\n * @license\n * Copyright 2018\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Equal',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T',\n 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'NotEqual',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'Greater',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b',\n 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'GreaterEqual',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'Less',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'LessEqual',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'LogicalAnd',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'LogicalOr',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n }\n]\n }\n];\n\n", "import { OpMapper } from '../types';\n\n/**\n * @license\n * Copyright 2018\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'LogicalNot',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'LogicalOr',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Select',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'condition', 'type': 'tensor'},\n {'start': 1, 'name': 'a', 'type': 'tensor'},\n {'start': 2, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'SelectV2',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'condition', 'type': 'tensor'},\n {'start': 1, 'name': 'a', 'type': 'tensor'},\n {'start': 2, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }]\n };\n";\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {OpMapper} from './types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': '_FusedMatMul',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n {'start': 2, 'end': 0, 'name': 'args', 'type': 'tensors'},\n],\n 'attrs': [\n {'tfName': 'num_args', 'name': 'numArgs', 'type': 'number'},\n {'tfName': 'fused_ops', 'name': 'fusedOps', 'type': 'string[]',\n 'defaultValue': []},\n {'tfName': 'epsilon', 'name': 'epsilon', 'type': 'number',\n 'defaultValue': 0.0001},\n {'tfName': 'transpose_a', 'name': 'transposeA', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'transpose_b', 'name': 'transposeB', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'MatMul',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'transpose_a', 'name': 'transposeA', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'transpose_b', 'name': 'transposeB', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'BatchMatMul',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'adj_x', 'name': 'transposeA', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'adj_y', 'name': 'transposeB', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'BatchMatMulV2',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'adj_x', 'name': 'transposeA', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'adj_y', 'name': 'transposeB', 'type': 'bool',\n 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Transpose',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'perm', 'type': 'number[]'},\n],\n 'attrs': [{\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }]\n };\n";\nimport {OpMapper} from './types';\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'FusedBatchNorm',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'FusedBatchNormV2',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'FusedBatchNormV3',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'LRN',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'depth_radius',\n 'name': 'radius',\n 'type': 'number',\n 'defaultValue': 5\n },\n {\n 'tfName': 'bias',\n 'name': 'bias',\n 'type': 'number',\n 'defaultValue': 1.0\n },\n {\n 'tfName': 'alpha',\n 'name': 'alpha',\n 'type': 'number',\n 'defaultValue': 1.0\n },\n {\n 'tfName': 'beta',\n 'name': 'beta',\n 'type': 'number',\n 'defaultValue': 0.5\n }\n]\n },\n {\n 'tfOpName': 'Softmax',\n 'category': 'normalization',\n 'inputs': [{\n 'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'LogSoftmax',\n 'category': 'normalization',\n 'inputs': [{\n 'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'SparseToDense',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'sparseIndices', 'type': 'tensor'},\n {'start': 1, 'name': 'outputShape', 'type': 'number[]'},\n {'start': 2, 'name': 'sparseValues', 'type': 'tensor'},\n {'start': 3, 'name': 'defaultValue', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'defaultValue': true,\n 'notSupported': true\n }]\n }]\n];\n\n", "import {OpMapper} from '../types';\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Bincount',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'size', 'type': 'number'},\n {'start': 2, 'name': 'weights', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'DenseBincount',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'size', 'type': 'number'},\n {'start': 2, 'name': 'weights', 'type': 'tensor'}\n],\n 'attrs': [\n {\n 'tfName': 'binary_output',\n 'name': 'binaryOutput',\n 'type': 'bool'}\n]\n },\n {\n 'tfOpName': 'Max',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n],\n 'attrs': [{\n 'tfName': 'keep_dims',\n 'name': 'keepDims',\n 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Mean',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n],\n 'attrs': [{\n 'tfName': 'keep_dims',\n 'name': 'keepDims',\n 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Min',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n],\n 'attrs': [{\n 'tfName': 'keep_dims',\n 'name': 'keepDims',\n 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Sum',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n],\n 'attrs': [{\n 'tfName': 'keep_dims',

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'name': 'keepDims', 'type': 'bool'})\n },\n {\n 'tfOpName': 'All',\n 'category': 'reduction',\n 'inputs': [\n
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'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n],\n 'attrs':
[{'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'ArgMax',\n 'category':
'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number'}]\n
}\n },\n {\n 'tfOpName': 'ArgMin',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type':
'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number'}]\n },\n {\n 'tfOpName': 'Prod',\n 'category':
'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type':
'number[]'},\n],\n 'attrs': [{tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName':
'Cumsum',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name':
'axis', 'type': 'number'}]\n },\n 'attrs': [\n {'tfName': 'exclusive', 'name': 'exclusive', 'type': 'bool'},\n
{'tfName': 'reverse', 'name': 'reverse', 'type': 'bool'}]\n }\n]\n };\n\n", "import {OpMapper} from './types';\n\n**\n *
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*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'ConcatV2',\n 'category': 'slice_join',\n 'inputs': [\n
{'start': 0, 'end': -1, 'name': 'tensors', 'type': 'tensors'},\n {'start': -1, 'name': 'axis', 'type': 'number'}]\n },\n
'attrs':\n [\n {'tfName': 'N', 'name': 'n', 'type': 'number', 'defaultValue': 2}\n],\n {\n 'tfOpName': 'Concat',\n
'category': 'slice_join',\n 'inputs': [\n {'start': 1, 'end': 0, 'name': 'tensors', 'type': 'tensors'},\n {'start': 0, 'name':
'axis', 'type': 'number'}]\n },\n 'attrs': [{tfName': 'N', 'name': 'n', 'type': 'number', 'defaultValue': 2}]\n },\n {\n
'tfOpName': 'GatherV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n
{'start': 1, 'name': 'indices', 'type': 'tensor'},\n {'start': 2, 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n],\n
'attrs': [{\n 'tfName': 'batch_dims',\n 'name': 'batchDims',\n 'type': 'number',\n 'defaultValue': 0\n }]\n },\n {\n
'tfOpName': 'Gather',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n
{'start': 1, 'name': 'indices', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name':
'validateIndices',\n 'type': 'bool',\n 'notSupported': true\n }]\n },\n {\n 'tfOpName': 'Reverse',\n
'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'dims', 'type':
'bool[]'}]\n },\n {\n 'tfOpName': 'ReverseV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name':
'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'}]\n },\n {\n 'tfOpName': 'Slice',\n
'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'begin', 'type':
'number[]'},\n {'start': 2, 'name': 'size', 'type': 'number[]'}]\n },\n {\n 'tfOpName': 'StridedSlice',\n
'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'begin', 'type':
'number[]'},\n {'start': 2, 'name': 'end', 'type': 'number[]'},\n {'start': 3, 'name': 'strides', 'type': 'number[]'},\n
],\n 'attrs': [\n {\n 'tfName': 'begin_mask',\n 'name': 'beginMask',\n 'type': 'number',\n
'defaultValue': 0\n },\n {\n 'tfName': 'end_mask',\n 'name': 'endMask',\n 'type': 'number',\n
'defaultValue': 0\n },\n {\n 'tfName': 'new_axis_mask',\n 'name': 'newAxisMask',\n 'type':
'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'ellipsis_mask',\n 'name': 'ellipsisMask',\n
'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'shrink_axis_mask',\n 'name':
'shrinkAxisMask',\n 'type': 'number',\n 'defaultValue': 0\n }]\n },\n {\n 'tfOpName': 'Pack',\n
'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'end': 0, 'name': 'tensors', 'type': 'tensors'},\n],\n 'attrs': [\n
{'tfName': 'axis', 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n],\n {\n 'tfOpName': 'Unpack',\n
'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'tensor', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName':
'axis', 'name': 'axis', 'type': 'number', 'defaultValue': 0},\n {\n 'tfName': 'num',\n 'name': 'num',\n 'type':

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'number',\n 'defaultValue': 0,\n 'notSupported': true\n }\n },\n {\n 'tfOpName': 'Tile',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'reps', 'type':\n'number[]'}\n],\n {\n 'tfOpName': 'Split',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name':\n'axis', 'type': 'number', 'defaultValue': 0},\n {'start': 1, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName':\n'num_split',\n 'name': 'numOrSizeSplits',\n 'type': 'number',\n 'defaultValue': 1\n }]\n },\n {\n 'tfOpName': 'SplitV',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start':\n1, 'name': 'numOrSizeSplits', 'type': 'number[]'},\n {'start': 2, 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n],\n },\n {\n 'tfOpName': 'ScatterNd',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'indices',\n'type': 'tensor'},\n {'start': 1, 'name': 'values', 'type': 'tensor'},\n {'start': 2, 'name': 'shape', 'type': 'number[]'}\n],\n },\n {\n 'tfOpName': 'GatherNd',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type':\n'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'tensor'}\n],\n },\n {\n 'tfOpName': 'SparseToDense',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'sparseIndices', 'type': 'tensor'},\n {'start': 1, 'name':\n'outputShape', 'type': 'number[]'},\n {'start': 2, 'name': 'sparseValues', 'type': 'tensor'},\n {'start': 3, 'name':\n'defaultValue', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'defaultValue': false,\n 'notSupported': true\n }]\n },\n],\n 'type': 'bool',\n 'defaultValue': false,\n 'notSupported': true\n }]\n }];\n\n",\n "import {OpMapper} from\n'./types';\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\nApache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\nLicense.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\non an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\nimplied.\n * See the License for the specific language governing permissions and\n * limitations under the\nLicense.\n *
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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'FFT',\n 'category': 'spectral',\n 'inputs': [{\n 'start': 0,\n 'name': 'x',\n 'type': 'tensor'\n }]\n },\n {\n 'tfOpName': 'IFFT',\n 'category': 'spectral',\n 'inputs': [{\n 'start': 0,\n 'name':\n'x',\n 'type': 'tensor'\n }]\n },\n {\n 'tfOpName': 'RFFT',\n 'category': 'spectral',\n 'inputs': [\n {'start': 0, 'name':\n'x', 'type': 'tensor'},\n {\n 'start': 1,\n 'name': 'fft_length',\n 'type': 'number',\n 'notSupported': true\n }\n],\n },\n {\n 'tfOpName': 'IRFFT',\n 'category': 'spectral',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type':\n'tensor'},\n {\n 'start': 1,\n 'name': 'fft_length',\n 'type': 'number',\n 'notSupported': true\n }\n],\n }]\n];\n\n",\n "import {OpMapper} from './types';\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights\nReserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\nexcept in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\nsoftware\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\nOR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\ngoverning permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Cast',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'SrcT',\n 'name': 'sdtype',\n 'type': 'dtype',\n 'notSupported': true\n },\n {\n 'tfName': 'DstT',\n 'name': 'dtype',\n 'type': 'dtype'\n }\n],\n },\n {\n 'tfOpName': 'ExpandDims',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type':\n'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number'}\n],\n },\n {\n 'tfOpName': 'MirrorPad',\n 'category':\n'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'padding', 'type':\n'number[]'},\n],\n 'attrs': [{\n 'tfName': 'mode',\n 'name': 'mode',\n 'type': 'string'\n }]\n },\n {\n 'tfOpName': 'Pad',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'padding',\n'type': 'number[]'},\n],\n 'attrs': [{\n 'tfName': 'constant_value',\n 'name': 'constantValue',\n 'type':\n'number',\n 'defaultValue': 0\n }]\n },\n {\n 'tfOpName': 'PadV2',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'padding', 'type': 'number[]'},\n {\n 'start': 2,\n
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'name': 'constantValue',\n 'type': 'number',\n 'defaultValue': 0\n }\n },\n {\n 'tfOpName': 'Reshape',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'shape', 'type': 'number[]'}\n],\n {\n 'tfOpName': 'Squeeze',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'axis',\n 'tfDeprecatedName': 'squeeze_dims',\n 'name': 'axis',\n 'type': 'number[]'\n }]\n },\n {\n 'tfOpName': 'SpaceToBatchND',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'blockShape', 'type': 'number[]'},\n {'start': 2, 'name': 'paddings', 'type': 'number[]'}\n],\n {\n 'tfOpName': 'BatchToSpaceND',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'blockShape', 'type': 'number[]'},\n {'start': 2, 'name': 'crops', 'type': 'number[]'}\n],\n },\n {\n 'tfOpName': 'DepthToSpace',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'block_size', 'name': 'blockSize', 'type': 'number'},\n {'tfName': 'data_format', 'name': 'dataFormat', 'type': 'string'}\n]\n },\n {\n 'tfOpName': 'BroadcastTo',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'shape', 'type': 'number[]'},\n],\n 'attrs': []\n }\n];\n },\n "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {DataType, env} from '@tensorflow/tfjs-core';\nimport * as tensorflow from './data/compiled_api';\nimport {getRegisteredOp} from './custom_op/register';\nimport {getNodeNameAndIndex} from './executors/utils';\nimport * as arithmetic from './op_list/arithmetic';\nimport * as basicMath from './op_list/basic_math';\nimport * as control from './op_list/control';\nimport * as convolution from './op_list/convolution';\nimport * as creation from './op_list/creation';\nimport * as dynamic from './op_list/dynamic';\nimport * as evaluation from './op_list/evaluation';\nimport * as graph from './op_list/graph';\nimport * as hashTable from './op_list/hash_table';\nimport * as image from './op_list/image';\nimport * as logical from './op_list/logical';\nimport * as matrices from './op_list/matrices';\nimport * as normalization from './op_list/normalization';\nimport * as reduction from './op_list/reduction';\nimport * as sliceJoin from './op_list/slice_join';\nimport * as spectral from './op_list/spectral';\nimport * as transformation from './op_list/transformation';\nimport {Graph, InputParamValue, Node, OpMapper, ParamValue} from './types';\n\nexport class OperationMapper {\n private static _instance: OperationMapper;\n private opMappers: {[key: string]: OpMapper};\n // Singleton instance for the mapper\n public static get Instance() {\n return this._instance || (this._instance = new this());\n }\n // Loads the op mapping from the JSON file.\n private constructor() {\n const ops = [\n arithmetic, basicMath, control, convolution, creation, dynamic,\n evaluation, logical, image, graph, matrices, normalization, reduction,\n sliceJoin, spectral, transformation, hashTable\n];\n const mappersJson: OpMapper[] = [].concat(...ops.map(op => op.json));\n this.opMappers = mappersJson.reduce<{[key: string]: OpMapper}>(\n (map, mapper: OpMapper) => {\n map[mapper.tfOpName] = mapper;\n return map;\n },\n {});\n }\n // Converts the model inference graph from TensorFlow GraphDef to local\n // representation for TensorFlow.js API\n transformGraph(\n graph: tensorflow.IGraphDef,\n signature: tensorflow.ISignatureDef = {}): Graph {\n const tfNodes = graph.node;\n const placeholders: Node[] = [];\n const weights: Node[] = [];\n const initNodes: Node[] = [];\n const nodes = tfNodes.reduce<{[key: string]: Node}>((map, node) => {\n map[node.name] = this.mapNode(node);\n if (node.op.startsWith('Placeholder')) {\n placeholders.push(map[node.name]);\n } else if (node.op === 'Const') {\n weights.push(map[node.name]);\n } else if (node.input == null || node.input.length === 0) {\n initNodes.push(map[node.name]);\n }\n return map;\n }, {});\n let inputs: Node[] = [];\n const outputs: Node[] = [];\n let inputNodeNameToKey: {[key: string]: string} = {};\n let outputNodeNameToKey: {[key:

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string]: string} = {};\n if (signature != null) {\n inputNodeNameToKey =
this.mapSignatureEntries(signature.inputs);\n outputNodeNameToKey =
this.mapSignatureEntries(signature.outputs);\n }\n const allNodes = Object.keys(nodes);\n allNodes.forEach(key => {\n const node = nodes[key];\n node.inputNames.forEach(name => {\n const
[nodeName,] = getNodeNameAndIndex(name);\n node.inputs.push(nodes[nodeName]);\n nodes[nodeName].children.push(node);\n });\n });\n // if signature has not outputs set, add any node that
does not have\n // outputs.\n if (Object.keys(outputNodeNameToKey).length === 0) {\n allNodes.forEach(key => {\n const node = nodes[key];\n if (node.children.length === 0) {\n outputs.push(node);\n }\n });\n } else {\n Object.keys(outputNodeNameToKey).forEach(name => {\n const [nodeName,] = getNodeNameAndIndex(name);\n const node = nodes[nodeName];\n if (node !=
null) {\n node.signatureKey = outputNodeNameToKey[name];\n outputs.push(node);\n }\n });\n }\n if (Object.keys(inputNodeNameToKey).length > 0) {\n Object.keys(inputNodeNameToKey).forEach(name => {\n const [nodeName,] =
getNodeNameAndIndex(name);\n const node = nodes[nodeName];\n if (node) {\n node.signatureKey
= inputNodeNameToKey[name];\n inputs.push(node);\n }\n });\n } else {\n inputs =
placeholders;\n }\n let functions = {};\n if (graph.library != null && graph.library.function != null) {\n functions = graph.library.function.reduce((functions, func) => {\n functions[func.signature.name] =
this.mapFunction(func);\n return functions;\n }, {} as {[key: string]: Graph});\n }\n const result: Graph
= {\n nodes, inputs, outputs, weights, placeholders, signature, functions;\n }\n if (initNodes.length > 0) {\n result.initNodes = initNodes;\n }\n return result;\n}\n\n private mapSignatureEntries(entries: {[k: string]:
tensorflow.ITensorInfo}) {\n return Object.keys(entries || {}).reduce<{[key: string]: string}>((prev, curr)
=> {\n prev[entries[curr].name] = curr;\n return prev;\n }, {});\n}\n\n private mapNode(node:
tensorflow.INodeDef): Node {\n // Unsupported ops will cause an error at run-time (not parse time), since\n // they may not be used by the actual execution subgraph.\n const mapper =\n getRegisteredOp(node.op) ||
this.opMappers[node.op] || {} as OpMapper;\n if (node.attr == null) {\n node.attr = {};\n }\n const
newNode: Node = {\n name: node.name,\n op: node.op,\n category: mapper.category,\n inputNames:\n (node.input ||\n []).map(input => input.startsWith('^') ? input.substr(1) : input),\n inputs: [],\n children: [],\n inputParams: {},\n attrParams: {},\n rawAttrs: node.attr\n };\n if (mapper.inputs !=
null) {\n newNode.inputParams =\n mapper.inputs.reduce<{[key: string]: InputParamValue}>(\n (map, param) => {\n map[param.name] = {\n type: param.type,\n inputIndexStart:
param.start,\n inputIndexEnd: param.end\n };\n return map;\n },\n {});\n }\n if (mapper.attrs != null) {\n newNode.attrParams =\n mapper.attrs.reduce<{[key: string]:
ParamValue}>((map, param) => {\n const type = param.type;\n let value = undefined;\n switch
(param.type) {\n case 'string':\n value = getStringParam(\n node.attr, param.tfName,\n param.defaultValue as string);\n if (value === undefined && !!param.tfDeprecatedName) {\n value = getStringParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as
string);\n }\n break;\n case 'string[]':\n value = getStringArrayParam(\n node.attr, param.tfName, param.defaultValue as string[]);\n if (value === undefined &&
!!param.tfDeprecatedName) {\n value = getStringArrayParam(\n node.attr,\n param.tfDeprecatedName,\n param.defaultValue as string[]);\n }\n break;\n case 'number':\n value = getNumberParam(\n node.attr, param.tfName,\n (param.defaultValue || 0) as number);\n if (value === undefined && !!param.tfDeprecatedName) {\n value = getNumberParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as number);\n }\n break;\n case 'number[]':\n value =
getNumericArrayParam(\n node.attr, param.tfName, param.defaultValue as number[]);\n if
(value === undefined && !!param.tfDeprecatedName) {\n value = getNumericArrayParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as number[]);\n }\n break;\n case 'bool':\n value = getBoolParam(\n node.attr, param.tfName,

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param.defaultValue as boolean);\n if (value === undefined && !param.tfDeprecatedName) {\n
value = getBoolParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as\n
boolean);\n }\n break;\n case 'bool[]':\n value = getBoolArrayParam(\n node.attr, param.tfName, param.defaultValue as boolean[]);\n if (value === undefined &&\n
!!param.tfDeprecatedName) {\n value = getBoolArrayParam(\n node.attr,\n
param.tfDeprecatedName,\n param.defaultValue as boolean[]);\n }\n break;\n
 case 'shape':\n value = getTensorShapeParam(\n node.attr, param.tfName, param.defaultValue\n
as number[]);\n if (value === undefined && !param.tfDeprecatedName) {\n value =\n
getTensorShapeParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as\n
number[]);\n }\n break;\n case 'shape[]':\n value =\n
getTensorShapeArrayParam(\n node.attr, param.tfName, param.defaultValue as number[][]);\n if (value === undefined && !param.tfDeprecatedName) {\n value = getTensorShapeArrayParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as number[][]);\n }\n break;\n case 'dtype':\n value = getDtypeParam(\n node.attr, param.tfName,\n param.defaultValue as\n
DataType);\n if (value === undefined && !param.tfDeprecatedName) {\n value =\n
getDtypeParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as\n
DataType);\n }\n break;\n case 'dtype[]':\n value = getDtypeArrayParam(\n node.attr, param.tfName, param.defaultValue as\n
DataType[]);\n if (value === undefined &&\n
!!param.tfDeprecatedName) {\n value = getDtypeArrayParam(\n node.attr,\n
param.tfDeprecatedName,\n param.defaultValue as\n
DataType[]);\n }\n break;\n case 'func':\n value = getFuncParam(\n node.attr, param.tfName, param.defaultValue as\n
string);\n if (value === undefined && !param.tfDeprecatedName) {\n value = getFuncParam(\n node.attr, param.tfDeprecatedName,\n param.defaultValue as\n
string);\n }\n break;\n case 'tensor':\n case 'tensors':\n break;\n default:\n throw new\n
Error(\n `Unsupported param type: ${param.type} for op: ${node.op}`);\n }\n
map[param.name] = {value, type};\n return map;\n }, {});\n }\n return newNode;\n}\n\n// map\n
the TFunctionDef to TFJS graph object\nprivate mapFunction(functionDef: tensorflow.IFunctionDef): Graph {\n
const tfNodes = functionDef.nodeDef;\n const placeholders: Node[] = [];\n const weights: Node[] = [];\n let\n
nodes: {[key: string]: Node} = {};\n if (tfNodes != null) {\n nodes = tfNodes.reduce<{[key: string]:\n
Node}>((map, node) => {\n map[node.name] = this.mapNode(node);\n if (node.op === 'Const') {\n weights.push(map[node.name]);\n }\n return map;\n }, {});\n }\n const inputs: Node[] = [];\n const\n
outputs: Node[] = [];\n functionDef.signature.inputArg.forEach(arg => {\n const [nodeName,] =\n
getNodeNameAndIndex(arg.name);\n const node: Node = {\n name: nodeName,\n op: 'Placeholder',\n inputs: [],\n inputNames: [],\n category: 'graph',\n inputParams: {},\n attrParams: {dtype: {value:\n
parseDtypeParam(arg.type), type: 'dtype'}},\n children: []\n }; \n node.signatureKey = arg.name;\n inputs.push(node);\n nodes[nodeName] = node;\n });\n const allNodes = Object.keys(nodes);\n allNodes.forEach(key => {\n const node = nodes[key];\n node.inputNames.forEach(name => {\n const\n
[nodeName,] = getNodeNameAndIndex(name);\n node.inputs.push(nodes[nodeName]);\n nodes[nodeName].children.push(node);\n });\n });\n const returnNodeMap = functionDef.ret;\n functionDef.signature.outputArg.forEach(output => {\n const [nodeName, index] =\n
getNodeNameAndIndex(returnNodeMap[output.name]);\n const node = nodes[nodeName];\n if (node != null)\n
{\n node.defaultOutput = index;\n outputs.push(node);\n }\n });\n const signature =\n
this.mapArgsToSignature(functionDef);\n return {nodes, inputs, outputs, weights, placeholders, signature};\n}\n\nprivate mapArgsToSignature(functionDef: tensorflow.IFunctionDef):\n
tensorflow.ISignatureDef {\n return {\n methodName: functionDef.signature.name,\n inputs: functionDef.signature.inputArg.reduce(\n (map, arg) => {\n map[arg.name] = this.mapArgToTensorInfo(arg);\n return map;\n },\n {})\n as {[key: string]: tensorflow.ITensorInfo},\n outputs: functionDef.signature.outputArg.reduce(\n (map,\n
arg) => {\n map[arg.name] = this.mapArgToTensorInfo(arg, functionDef.ret);\n return map;\n }\n

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},\n {} as {[key: string]: tensorflow.ITensorInfo}),\n });\n }\n\n private mapArgToTensorInfo(\n arg:\n tensorflow.OpDef.IArgDef,\n nameMap?: {[key: string]: string}): tensorflow.ITensorInfo {\n let name =\n arg.name;\n if (nameMap != null) {\n name = nameMap[name];\n }\n return {name, dtype: arg.type};\n }\n}\n\nexport function decodeBase64(text: string): string {\n const global = env().global;\n if (typeof global.atob\n !== 'undefined') {\n return global.atob(text);\n } else if (typeof Buffer !== 'undefined') {\n return new\n Buffer(text, 'base64').toString();\n } else {\n throw new Error(\n 'Unable to decode base64 in this\n environment. ' +\n 'Missing built-in atob() or Buffer()');\n }\n}\n\nexport function parseStringParam(s: []|string,\n keepCase: boolean): string {\n const value =\n Array.isArray(s) ? String.fromCharCode.apply(null, s) :\n decodeBase64(s);\n return keepCase ? value : value.toLowerCase();\n}\n\nexport function getStringParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: string,\n keepCase = false): string {\n const param\n = attrs[name];\n if (param != null) {\n return parseStringParam(param.s, keepCase);\n }\n return\n def;\n}\n\nexport function getBoolParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def:\n boolean): boolean {\n const param = attrs[name];\n return param ? param.b : def;\n}\n\nexport function\n getNumberParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: number): number {\n const param = attrs[name] || {};\n const value =\n param['i'] != null ? param['i'] : (param['f'] != null ? param['f'] :\n def);\n return (typeof value === 'number') ? value : parseInt(value, 10);\n}\n\nexport function\n parseDtypeParam(value: string|tensorflow.DataType): DataType {\n if (typeof (value) === 'string') {\n //\n tslint:disable-next-line:no-any\n value = tensorflow.DataType[value as any];\n }\n switch (value) {\n case\n tensorflow.DataType.DT_FLOAT:\n return 'float32';\n case tensorflow.DataType.DT_INT32:\n case\n tensorflow.DataType.DT_INT64:\n return 'int32';\n case tensorflow.DataType.DT_INT8:\n case\n tensorflow.DataType.DT_UINT8:\n return 'int32';\n case tensorflow.DataType.DT_BOOL:\n return 'bool';\n case\n tensorflow.DataType.DT_DOUBLE:\n return 'float32';\n case tensorflow.DataType.DT_STRING:\n return 'string';\n default:\n // Unknown dtype error will happen at runtime (instead of parse time),\n // since\n these nodes might not be used by the actual subgraph execution.\n return null;\n }\n}\n\nexport function\n getFuncParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: string): string {\n const\n param = attrs[name];\n if (param && param.func) {\n return param.func.name;\n }\n return\n def;\n}\n\nexport\n function getDtypeParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: DataType):\n DataType {\n const param = attrs[name];\n if (param && param.type) {\n return\n parseDtypeParam(param.type);\n }\n return\n def;\n}\n\nexport function\n getDtypeArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: DataType[]):\n DataType[] {\n const param = attrs[name];\n if\n (param && param.list && param.list.type) {\n return\n param.list.type.map(v => parseDtypeParam(v));\n }\n return\n def;\n}\n\nexport function\n parseTensorShapeParam(shape: tensorflow.ITensorShape): number[]|\n undefined {\n if (shape.unknownRank) {\n return\n undefined;\n }\n if (shape.dim != null) {\n return\n shape.dim.map(\n dim =>\n (typeof dim.size === 'number') ? dim.size : parseInt(dim.size, 10);\n);\n }\n return\n [];\n}\n\nexport function\n getTensorShapeParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name:\n string,\n def?: number[]): number[]|undefined {\n const param = attrs[name];\n if\n (param && param.shape) {\n return\n parseTensorShapeParam(param.shape);\n }\n return\n def;\n}\n\nexport function\n getNumericArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: number[]):\n number[] {\n const param =\n attrs[name];\n if (param) {\n return\n ((param.list.f && param.list.f.length ? param.list.f :\n param.list.i) ||\n [])\n .map(v => (typeof v === 'number') ? v : parseInt(v, 10));\n }\n return\n def;\n}\n\nexport function\n getStringArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def:\n string[],\n keepCase = false): string[] {\n const param = attrs[name];\n if\n (param && param.list && param.list.s)\n {\n return\n param.list.s.map((v) => {\n return\n parseStringParam(v, keepCase);\n });\n }\n return\n def;\n}\n\nexport function\n getTensorShapeArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name:\n string,\n def: number[][]):\n number[][] {\n const param = attrs[name];\n if\n (param && param.list && param.list.shape) {\n return\n param.list.shape.map((v) => {\n return\n parseTensorShapeParam(v);\n });\n }\n return\n def;\n}\n\nexport function\n getBoolArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name:\n string,\n def: boolean[]):\n boolean[] {\n const param = attrs[name];\n if\n (param && param.list && param.list.b)\n {\n return\n param.list.b.map(v => {\n return\n parseBoolParam(v);\n });\n }\n return\n def;\n}\n}

```

{\n return param.list.b;\n }\n return def;\n}\n", "/\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* \n \* http://www.apache.org/licenses/LICENSE-2.0\n \* \n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {DataType, Tensor} from '@tensorflow/tfjs-core';\nimport {NamedTensorsMap} from './../data/types';\nimport {ExecutionContext} from './../executor/execution_context';\nimport {getTensor} from './executors/utils';\nimport {getBoolArrayParam, getBoolParam, getDtypeArrayParam, getDtypeParam, getNumberParam, getNumericArrayParam, getStringArrayParam, getStringParam, getTensorShapeArrayParam, getTensorShapeParam} from './operation_mapper';\nimport {GraphNode, Node, ValueType} from './types';\n\n/**\n * Helper class for lookup inputs and params for nodes in the model graph.\n */\nexport class NodeValueImpl implements GraphNode {\n public readonly inputs: Tensor[] = [];\n public readonly attrs: {[key: string]: ValueType} = {};\n constructor(\n private node: Node, private tensorMap: NamedTensorsMap,\n private context: ExecutionContext) {\n this.inputs = node.inputNames.map(name => this.getInput(name));\n if (node.rawAttrs != null) {\n this.attrs = Object.keys(node.rawAttrs)\n .reduce((attrs: {[key: string]: ValueType}, key) => {\n attrs[key] = this.getAttr(key);\n return attrs;\n }, {});\n }\n }\n\n /**\n * Return the value of the attribute or input param.\n * @param name String: name of attribute or input param.\n */\n private getInput(name: string): Tensor {\n return getTensor(name, this.tensorMap, this.context);\n }\n\n /**\n * Return the value of the attribute or input param.\n * @param name String: name of attribute or input param.\n */\n private getAttr(name: string, defaultValue?: ValueType): ValueType {\n const value = this.node.rawAttrs[name];\n if (value.tensor != null) {\n return getTensor(name, this.tensorMap, this.context);\n }\n if (value.i != null || value.f != null) {\n return getNumberParam(this.node.rawAttrs, name, defaultValue as number);\n }\n if (value.s != null) {\n return getStringParam(this.node.rawAttrs, name, defaultValue as string);\n }\n if (value.b != null) {\n return getBoolParam(this.node.rawAttrs, name, defaultValue as boolean);\n }\n if (value.shape != null) {\n return getTensorShapeParam(\n this.node.rawAttrs, name, defaultValue as number[]);\n }\n if (value.type != null) {\n return getDtypeParam(this.node.rawAttrs, name, defaultValue as DataType);\n }\n if (value.list != null) {\n if (value.list.i != null || value.list.f != null) {\n return getNumericArrayParam(\n this.node.rawAttrs, name, defaultValue as number[]);\n }\n if (value.list.s != null) {\n return getStringArrayParam(\n this.node.rawAttrs, name, defaultValue as string[]);\n }\n if (value.list.shape != null) {\n return getTensorShapeArrayParam(\n this.node.rawAttrs, name, defaultValue as number[][]);\n }\n if (value.list.b != null) {\n return getBoolArrayParam(\n this.node.rawAttrs, name, defaultValue as boolean[]);\n }\n if (value.list.type != null) {\n return getDtypeArrayParam(\n this.node.rawAttrs, name, defaultValue as DataType[]);\n }\n }\n return defaultValue;\n }\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\n/**\n * This file exports ops used by the converters executors. By default it\n * re-exports all ops. In a custom build this is aliased to a file that will\n * only exports ops for a given model.json.\n */\nexport * from './ops';\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
```

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```
=====
*
import {Tensor} from '@tensorflow/tfjs-core';
// tslint:disable-next-line: no-imports-from-dist
import * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';
import {NamedTensorsMap} from '../data/types';
import {ExecutionContext} from '../executor/execution_context';
import {InternalOpExecutor, Node} from '../types';
import {getParamValue} from './utils';
export const executeOp: InternalOpExecutor =
(node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {
 switch (node.op) {
 case 'BiasAdd':
 case 'AddV2':
 case 'Add': {
 return [tfOps.add(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'AddN': {
 return [tfOps.addN(
 getParamValue('tensors', node, tensorMap, context) as Tensor[],
 context)];
 }
 case 'FloorMod':
 case 'Mod': {
 return [tfOps.mod(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'Mul':
 case 'RealDiv':
 case 'Div': {
 return [tfOps.div(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'DivNoNaN': {
 return [tfOps.divNoNaN(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'FloorDiv': {
 return [tfOps.floorDiv(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'Sub': {
 return [tfOps.sub(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'Minimum': {
 return [tfOps.minimum(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'Maximum': {
 return [tfOps.maximum(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'Pow': {
 return [tfOps.pow(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 case 'SquaredDifference': {
 return [tfOps.squaredDifference(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }
 default: {
 throw TypeError(`Node type ${node.op} is not implemented`);
 }
 }
};
export const CATEGORY = 'arithmetic';
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```

=====  
\*  
import {Tensor} from '@tensorflow/tfjs-core';  
// tslint:disable-next-line: no-imports-from-dist  
import \* as tfOps from '@tensorflow/tfjs-core/dist/ops/ops\_for\_converter';  
import {NamedTensorsMap} from '../data/types';  
import {ExecutionContext} from '../executor/execution\_context';  
import {InternalOpExecutor, Node} from '../types';  
import {getParamValue, getTensor} from './utils';  
export const executeOp: InternalOpExecutor =  
(node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {  
 switch (node.op) {  
 case 'Abs':  
 case 'ComplexAbs': {  
 return [tfOps.abs(  
 getParamValue('x', node, tensorMap, context) as Tensor)];  
 }  
 case 'Acos':  
 case 'Acosh': {  
 return [tfOps.acos(  
 getParamValue('x', node, tensorMap, context) as Tensor)];  
 }  
 case 'Acosh': {  
 return [tfOps.acosh(  
 getParamValue('x', node, tensorMap, context) as Tensor)];  
 }  
 }  
};



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```
=====\n*\n**\n * This differs from util.assertShapesMatch in that it allows values of\n * negative one, an undefined size of\n * a dimension, in a shape to match\n * anything.\n *\nimport {Tensor, util} from '@tensorflow/tfjs-core';\n\n * Used by TensorList and TensorArray to verify if elementShape matches, support\n * negative value as the dim
shape.\n * @param shapeA\n * @param shapeB\n * @param errorMessagePrefix\n */\nexport function
assertShapesMatchAllowUndefinedSize(\n shapeA: number|number[], shapeB: number|number[],\n errorMessagePrefix = \"\"): void {\n // constant shape means unknown rank\n if (typeof shapeA === 'number' || typeof
shapeB === 'number') {\n return;\n }\n util.assert(\n shapeA.length === shapeB.length,\n () =>
errorMessagePrefix + `Shapes ${shapeA} and ${shapeB} must match`);\n for (let i = 0; i < shapeA.length; i++) {\n const dim0 = shapeA[i];\n const dim1 = shapeB[i];\n util.assert(\n dim0 < 0 || dim1 < 0 || dim0 === dim1,\n () =>\n errorMessagePrefix + `Shapes ${shapeA} and ${shapeB} must match`);\n }\n}\n\nexport
function fullDefinedShape(elementShape: number|number[]): boolean {\n if (typeof elementShape === 'number' ||
elementShape.some(dim => dim < 0)) {\n return false;\n }\n return true;\n}\n\n * Generate the output element
shape from the list elementShape, list tensors\n * and input param.\n * @param listElementShape\n * @param
tensors\n * @param elementShape\n */\nexport function inferElementShape(\n listElementShape:
number|number[], tensors: Tensor[],\n elementShape: number|number[]): number[] {\n let partialShape =
mergeElementShape(listElementShape, elementShape);\n const notfullDefinedShape =
!fullDefinedShape(partialShape);\n if (notfullDefinedShape && tensors.length === 0) {\n throw new Error(\n `Tried to calculate elements of an empty list` +\n ` with non-fully-defined elementShape: ${partialShape}`);\n }\n if (notfullDefinedShape) {\n tensors.forEach(tensor => {\n partialShape =
mergeElementShape(tensor.shape, partialShape);\n });\n }\n if (!fullDefinedShape(partialShape)) {\n throw
new Error(`Non-fully-defined elementShape: ${partialShape}`);\n }\n return partialShape as
number[];\n}\n\nexport function mergeElementShape(\n elementShapeA: number|number[], elementShapeB:
number|number[]): number|\n number[] {\n if (typeof elementShapeA === 'number') {\n return
elementShapeB;\n }\n if (typeof elementShapeB === 'number') {\n return elementShapeA;\n }\n if
(elementShapeA.length !== elementShapeB.length) {\n throw new Error(`Incompatible ranks during merge:
${elementShapeA} vs. ${\n elementShapeB}`);\n }\n const result: number[] = [];\n for (let i = 0; i <
elementShapeA.length; ++i) {\n const dim0 = elementShapeA[i];\n const dim1 = elementShapeB[i];\n if (dim0
>= 0 && dim1 >= 0 && dim0 !== dim1) {\n throw new Error(`Incompatible shape during merge:
${elementShapeA} vs. ${\n elementShapeB}`);\n }\n result[i] = dim0 >= 0 ? dim0 : dim1;\n }\n return
result;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

```
=====\n*\n\nimport {concat, DataType, keep, reshape, scalar, slice, stack, Tensor, tensor, tidy, unstack} from
'@tensorflow/tfjs-core';\nimport {assertShapesMatchAllowUndefinedSize} from './tensor_utils';\nexport
interface TensorWithState {\n tensor?: Tensor;\n written?: boolean;\n read?: boolean;\n cleared?:
boolean;\n}\n\n * The TensorArray object keeps an array of Tensors. It\n * allows reading from the array and
writing to the array.\n */\nexport class TensorArray {\n private tensors: TensorWithState[] = [];\n private closed_ =
```

```

false;\n readonly idTensor: Tensor;\n constructor(\n readonly name: string, readonly dtype: DataType, private
maxSize: number,\n private elementShape: number[], readonly identicalElementShapes: boolean,\n readonly
dynamicSize: boolean, readonly clearAfterRead: boolean) {\n this.idTensor = scalar(0);\n keep(this.idTensor);\n
}\n\n get id() {\n return this.idTensor.id;\n }\n\n get closed() {\n return this.closed_;\n }\n\n /**\n * Dispose
the tensors and idTensor and mark the TensorArray as closed.\n */\n clearAndClose(keepIds?: Set<number>) {\n
this.tensors.forEach(tensor => {\n if (keepIds == null || !keepIds.has(tensor.tensor.id)) {\n
tensor.tensor.dispose();\n }\n });\n this.tensors = [];\n this.closed_ = true;\n this.idTensor.dispose();\n
}\n\n size(): number {\n return this.tensors.length;\n }\n\n /**\n * Read the value at location index in the
TensorArray.\n * @param index Number the index to read from.\n */\n read(index: number): Tensor {\n if
(this.closed_) {\n throw new Error(`TensorArray ${this.name} has already been closed.`);\n }\n if (index <
0 || index >= this.size()) {\n throw new Error(`Tried to read from index ${index}, but array size is: ${\n
this.size()}`);\n }\n const tensorWithState = this.tensors[index];\n if (tensorWithState.cleared) {\n throw
new Error(\n `TensorArray ${this.name}: Could not read index ${\n index} twice because it was
cleared after a previous read ` +\n `(perhaps try setting clear_after_read = false?`.);\n }\n if
(this.clearAfterRead) {\n tensorWithState.cleared = true;\n }\n tensorWithState.read = true;\n return
tensorWithState.tensor;\n }\n\n /**\n * Helper method to read multiple tensors from the specified indices.\n */\n
readMany(indices: number[]): Tensor[] {\n return indices.map(index => this.read(index));\n }\n\n /**\n * Write
value into the index of the TensorArray.\n * @param index number the index to write to.\n * @param tensor\n
*/\n write(index: number, tensor: Tensor) {\n if (this.closed_) {\n throw new Error(`TensorArray ${this.name}
has already been closed.`);\n }\n if (index < 0 || this.dynamicSize && index >= this.maxSize) {\n throw
new Error(`Tried to write to index ${\n index}, but array is not resizeable and size is: ${this.maxSize}`);\n
}\n const t = this.tensors[index] || {};\n if (tensor.dtype !== this.dtype) {\n throw new Error(`TensorArray
${\n this.name}: Could not write to TensorArray index ${index},\n because the value dtype is ${\n
tensor.dtype}, but TensorArray dtype is ${this.dtype}`);\n }\n // Set the shape for the first time write to
unknow shape tensor array\n if (this.size() === 0 &&\n (this.elementShape == null || this.elementShape.length
=== 0)) {\n this.elementShape = tensor.shape;\n }\n assertShapesMatchAllowUndefinedSize(\n this.elementShape, tensor.shape,\n `TensorArray ${this.name}: Could not write to TensorArray index ${\n
index}`);\n if (t.read) {\n throw new Error(\n `TensorArray ${this.name}: Could not write to
TensorArray index ${\n index}, because it has already been read.`);\n }\n if (t.written) {\n throw
new Error(\n `TensorArray ${this.name}: Could not write to TensorArray index ${\n index}, because
it has already been written.`);\n }\n t.tensor = tensor;\n keep(tensor);\n t.written = true;\n this.tensors[index] = t;\n }\n\n /**\n * Helper method to write multiple tensors to the specified indices.\n */\n
writeMany(indices: number[], tensors: Tensor[]) {\n if (indices.length !== tensors.length) {\n throw new
Error(\n `TensorArray ${this.name}: could not write multiple tensors,`\n `because the index size: ${\n
indices.length} is not the same as tensors size: ${\n tensors.length}`);\n }\n indices.forEach((i,
index) => this.write(i, tensors[index]));\n }\n\n /**\n * Return selected values in the TensorArray as a packed
Tensor. All of\n * selected values must have been written and their shapes must all match.\n * @param [indices]
number[] Optional. Taking values in [0, max_value). If the\n * TensorArray is not dynamic, max_value=size(). If
not specified returns\n * all tensors in the original order.\n * @param [dtype]\n */\n gather(indices?: number[],
dtype?: DataType): Tensor {\n if (!!dtype && dtype !== this.dtype) {\n throw new Error(`TensorArray dtype is
${\n this.dtype} but gather requested dtype ${dtype}`);\n }\n if (!indices) {\n indices = [];\n for (let
i = 0; i < this.size(); i++) {\n indices.push(i);\n }\n } else {\n indices = indices.slice(0, this.size());\n
}\n if (indices.length === 0) {\n return tensor([], [0].concat(this.elementShape));\n }\n // Read all the
PersistentTensors into a vector to keep track of\n // their memory.\n const tensors = this.readMany(indices);\n assertShapesMatchAllowUndefinedSize(\n this.elementShape, tensors[0].shape, "TensorArray shape mismatch:
");\n return stack(tensors, 0);\n }\n\n /**\n * Return the values in the TensorArray as a concatenated Tensor.\n
*/\n concat(dtype?: DataType): Tensor {\n if (!!dtype && dtype !== this.dtype) {\n throw new
Error(`TensorArray dtype is ${\n this.dtype} but concat requested dtype ${dtype}`);\n }\n if (this.size()

```

```

=== 0) {\n return tensor([], [0].concat(this.elementShape));\n }\n\n const indices = [];\n for (let i = 0; i <
this.size(); i++) {\n indices.push(i);\n }\n // Collect all the tensors from the tensors array.\n const tensors =
this.readMany(indices);\n\n assertShapesMatchAllowUndefinedSize(\n this.elementShape, tensors[0].shape,\n '\n `TensorArray shape mismatch: tensor array shape (${this.elementShape}) vs first tensor shape
(${tensors[0].shape})`);\n\n return concat(tensors, 0);\n }\n\n /**\n * Scatter the values of a Tensor in specific
indices of a TensorArray.\n * @param indices nummber[] values in [0, max_value). If the\n * TensorArray is
not dynamic, max_value=size().\n * @param tensor Tensor input tensor.\n */\n scatter(indices: number[], tensor:
Tensor) {\n if (tensor.dtype !== this.dtype) {\n throw new Error(`TensorArray dtype is ${this.dtype}
but tensor has dtype ${tensor.dtype}`);\n }\n\n if (indices.length !== tensor.shape[0]) {\n throw new
Error(`Expected len(indices) == tensor.shape[0], but saw: ${indices.length} vs. ${tensor.shape[0]}`);\n }\n\n const maxIndex = Math.max(...indices);\n\n if (!this.dynamicSize && maxIndex >= this.maxSize) {\n throw new Error(\n `Max index must be < array size (${maxIndex} vs. ${this.maxSize})`);\n }\n\n this.writeMany(indices, unstack(tensor, 0));\n }\n\n /**\n * Split the values of a Tensor into the TensorArray.\n *
@param length number[] with the lengths to use when splitting value along\n * its first dimension.\n * @param
tensor Tensor, the tensor to split.\n */\n split(length: number[], tensor: Tensor) {\n if (tensor.dtype !==
this.dtype) {\n throw new Error(`TensorArray dtype is ${this.dtype} but tensor has dtype
${tensor.dtype}`);\n }\n\n let totalLength = 0;\n const cumulativeLengths = length.map(len => {\n
totalLength += len;\n return totalLength;\n });\n\n if (totalLength !== tensor.shape[0]) {\n throw new
Error(`Expected sum of lengths to be equal to\n tensor.shape[0], but sum of lengths is\n ${totalLength},
and tensor's shape is: ${tensor.shape}`);\n }\n\n if (!this.dynamicSize && length.length !== this.maxSize) {\n
throw new Error(\n `TensorArray's size is not equal to the size of lengths (${this.maxSize} vs.
${length.length}),\n ` and the TensorArray is not marked as dynamically resizable`);\n }\n\n const
elementPerRow = totalLength === 0 ? 0 : tensor.size / totalLength;\n const tensors: Tensor[] = [];\n tidy(() =>
{\n tensor = reshape(tensor, [1, totalLength, elementPerRow]);\n for (let i = 0; i < length.length; ++i) {\n
const previousLength = (i === 0) ? 0 : cumulativeLengths[i - 1];\n const indices = [0, previousLength, 0];\n
const sizes = [1, length[i], elementPerRow];\n tensors[i] = reshape(slice(tensor, indices, sizes),
this.elementShape);\n }\n\n return tensors;\n });\n\n const indices = [];\n for (let i = 0; i < length.length; i++)
{\n indices[i] = i;\n }\n\n this.writeMany(indices, tensors);\n }\n}\n\n", "*/\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {concat, DataType, keep, reshape, scalar, slice, stack, Tensor, tensor, tidy, unstack} from
'@tensorflow/tfjs-core';\n\nimport {assertShapesMatchAllowUndefinedSize, inferElementShape,
mergeElementShape} from './tensor_utils';\n\n/**\n * TensorList stores a container of `tf.Tensor` objects, which are
accessible\n * via tensors field.\n * In order to get a copy of the underlying list, use the copy method:\n * ```\n *
TensorList b = a.copy();\n * b.tensors().pushBack(t); // This does not modify a.tensors().\n * ```\n * Note that
this is not a deep copy: the memory locations of the underlying\n * tensors will still point to the same locations of
the corresponding tensors\n * in the original.\n */\n\nexport class TensorList {\n readonly idTensor: Tensor;\n
 maxNumElements: number;\n\n get id() {\n return this.idTensor.id;\n }\n\n /**\n * @param tensors list of
tensors\n * @param elementShape shape of each tensor, this can be a single number (any\n * shape is allowed) or
partial shape (dim = -1).\n * @param elementDtype data type of each tensor\n * @param maxNumElements The
maximum allowed size of `tensors`. Defaults to -1\n * meaning that the size of `tensors` is unbounded.\n */\n
 constructor(\n readonly tensors: Tensor[],\n readonly elementShape: number|number[],\n readonly
elementDtype: DataType, maxNumElements = -1) {\n if (tensors != null) {\n tensors.forEach(tensor => {\n

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if (elementDtype !== tensor.dtype) {\n throw new Error(`Invalid data types; op elements ${\n
elementDtype}`, but list elements ${tensor.dtype}`);\n }\n assertShapesMatchAllowUndefinedSize(\n
elementShape, tensor.shape, 'TensorList shape mismatch: ');\n keep(tensor);\n });\n }\n this.idTensor =
scalar(0);\n this.maxNumElements = maxNumElements;\n keep(this.idTensor);\n }\n /**\n * Get a new
TensorList containing a copy of the underlying tensor container.\n */\n copy(): TensorList {\n return new
TensorList(\n [...this.tensors], this.elementShape, this.elementDtype);\n }\n /**\n * Dispose the tensors and
idTensor and clear the tensor list.\n */\n clearAndClose(keepIds?: Set<number>) {\n this.tensors.forEach(tensor
=> {\n if (keepIds == null || !keepIds.has(tensor.id)) {\n tensor.dispose();\n }\n });\n
this.tensors.length = 0;\n this.idTensor.dispose();\n }\n /**\n * The size of the tensors in the tensor list.\n */\n
size() {\n return this.tensors.length;\n }\n /**\n * Return a tensor that stacks a list of rank-R tf.Tensors into
one rank-(R+1)\n * tf.Tensor.\n * @param elementShape shape of each tensor\n * @param elementDtype data
type of each tensor\n * @param numElements the number of elements to stack\n */\n stack(elementShape:
number[], elementDtype: DataType, numElements = -1):\n Tensor {\n if (elementDtype !== this.elementDtype)
{\n throw new Error(`Invalid data types; op elements ${\n elementDtype}`, but list elements
${this.elementDtype}`);\n }\n if (numElements !== -1 && this.tensors.length !== numElements) {\n throw
new Error(`Operation expected a list with ${\n numElements} elements but got a list with ${\n
this.tensors.length} elements.`);\n }\n assertShapesMatchAllowUndefinedSize(\n elementShape,
this.elementShape, 'TensorList shape mismatch: ');\n const outputElementShape =\n inferElementShape(this.elementShape, this.tensors, elementShape);\n return tidy(() => {\n const
reshapedTensors =\n this.tensors.map(tensor => reshape(tensor, outputElementShape));\n return
stack(reshapedTensors, 0);\n });\n }\n /**\n * Pop a tensor from the end of the list.\n * @param
elementShape shape of the tensor\n * @param elementDtype data type of the tensor\n */\n popBack(elementShape: number[], elementDtype: DataType): Tensor {\n if (elementDtype !==
this.elementDtype) {\n throw new Error(`Invalid data types; op elements ${\n elementDtype}`, but list
elements ${this.elementDtype}`);\n }\n if (this.size() === 0) {\n throw new Error('Trying to pop from an
empty list.);\n }\n const outputElementShape =\n inferElementShape(this.elementShape, this.tensors,
elementShape);\n const tensor = this.tensors.pop();\n assertShapesMatchAllowUndefinedSize(\n tensor.shape, elementShape, 'TensorList shape mismatch: ');\n return reshape(tensor, outputElementShape);\n }\n /**\n * Push a tensor to the end of the list.\n * @param tensor Tensor to be pushed.\n */\n
pushBack(tensor: Tensor) {\n if (tensor.dtype !== this.elementDtype) {\n throw new Error(`Invalid data types;
op elements ${\n tensor.dtype}`, but list elements ${this.elementDtype}`);\n }\n assertShapesMatchAllowUndefinedSize(\n tensor.shape, this.elementShape, 'TensorList shape mismatch: ');\n if (this.maxNumElements === this.size()) {\n throw new Error(`Trying to push element into a full list.`);\n }\n keep(tensor);\n this.tensors.push(tensor);\n }\n /**\n * Update the size of the list.\n * @param size the new
size of the list.\n */\n resize(size: number) {\n if (size < 0) {\n throw new Error(`\n `TensorListResize
expects size to be non-negative. Got: ${size}`);\n }\n if (this.maxNumElements !== -1 && size >
this.maxNumElements) {\n throw new Error(`TensorListResize input size ${\n size} is greater
maxNumElement ${this.maxNumElements}.`);\n }\n this.tensors.length = size;\n }\n /**\n * Retrieve the
element at the provided index\n * @param elementShape shape of the tensor\n * @param elementDtype dtype of
the tensor\n * @param elementIndex index of the tensor\n */\n getItem(elementIndex: number, elementShape:
number[], elementDtype: DataType):\n Tensor {\n if (elementDtype !== this.elementDtype) {\n throw new
Error(`Invalid data types; op elements ${\n elementDtype}`, but list elements ${this.elementDtype}`);\n }\n
if (elementIndex < 0 || elementIndex > this.tensors.length) {\n throw new Error(`Trying to access element ${\n
 elementIndex} in a list with ${this.tensors.length} elements.`);\n }\n if (this.tensors[elementIndex] == null)
{\n throw new Error(`element at index ${elementIndex} is null.`);\n }\n assertShapesMatchAllowUndefinedSize(\n this.tensors[elementIndex].shape, elementShape,\n 'TensorList
shape mismatch: ');\n const outputElementShape =\n inferElementShape(this.elementShape, this.tensors,
elementShape);\n return reshape(this.tensors[elementIndex], outputElementShape);\n }\n /**\n * Set the

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tensor at the index\n * @param elementIndex index of the tensor\n * @param tensor the tensor to be inserted into
the list\n */\n setItem(elementIndex: number, tensor: Tensor) {\n if (tensor.dtype !== this.elementDType) {\n
throw new Error(`Invalid data types; op elements ${\n tensor.dtype}, but list elements
${this.elementDType}`);\n }\n\n if (elementIndex < 0 ||\n this.maxNumElements !== -1 && elementIndex
>= this.maxNumElements) {\n throw new Error(`Trying to set element ${\n elementIndex} in a list with
max ${this.maxNumElements} elements.`);\n }\n\n assertShapesMatchAllowUndefinedSize(\n
this.elementShape, tensor.shape, "TensorList shape mismatch: ");\n keep(tensor);\n this.tensors[elementIndex] =
tensor;\n }\n\n /**\n * Return selected values in the TensorList as a stacked Tensor. All of\n * selected values
must have been written and their shapes must all match.\n * @param indices indices of tensors to gather\n *
@param elementDType output tensor dtype\n * @param elementShape output tensor element shape\n */\n
gather(indices: number[], elementDType: DataType, elementShape: number[]):\n Tensor {\n if (elementDType
!== this.elementDType) {\n throw new Error(`Invalid data types; op elements ${\n elementDType}, but list
elements ${this.elementDType}`);\n }\n\n assertShapesMatchAllowUndefinedSize(\n this.elementShape,
elementShape, "TensorList shape mismatch: ");\n\n // When indices is greater than the size of the list, indices
beyond the\n // size of the list are ignored.\n indices = indices.slice(0, this.size());\n const outputElementShape
=\n inferElementShape(this.elementShape, this.tensors, elementShape);\n if (indices.length === 0) {\n
return tensor([], [0].concat(outputElementShape));\n }\n\n return tidy(() => {\n const tensors =\n
indices.map(i => reshape(this.tensors[i], outputElementShape));\n return stack(tensors, 0);\n });\n }\n\n /**\n
* Return the values in the TensorList as a concatenated Tensor.\n * @param elementDType output tensor dtype\n
* @param elementShape output tensor element shape\n */\n concat(elementDType: DataType, elementShape:
number[]): Tensor {\n if (!elementDType && elementDType !== this.elementDType) {\n throw new
Error(`TensorList dtype is ${\n this.elementDType} but concat requested dtype ${elementDType}`);\n }\n\n
assertShapesMatchAllowUndefinedSize(\n this.elementShape, elementShape, "TensorList shape mismatch: ");\n
const outputElementShape =\n inferElementShape(this.elementShape, this.tensors, elementShape);\n\n if
(this.size() === 0) {\n return tensor([], [0].concat(outputElementShape));\n }\n return tidy(() => {\n const
tensors = this.tensors.map(t => reshape(t, outputElementShape));\n return concat(tensors, 0);\n });\n
}\n\n /**\n * Creates a TensorList which, when stacked, has the value of tensor.\n * @param tensor from tensor\n
* @param elementShape output tensor element shape\n */\n export function fromTensor(\n tensor: Tensor,
elementShape: number[], elementDType: DataType) {\n const dtype = tensor.dtype;\n if (tensor.shape.length < 1)
{\n throw new Error(\n `Tensor must be at least a vector, but saw shape: ${tensor.shape}`);\n }\n if
(tensor.dtype !== elementDType) {\n throw new Error(`Invalid data types; op elements ${\n tensor.dtype}, but
list elements ${elementDType}`);\n }\n const tensorElementShape = tensor.shape.slice(1);\n
assertShapesMatchAllowUndefinedSize(\n tensorElementShape, elementShape, "TensorList shape mismatch:
");\n const tensorList: Tensor[] = unstack(tensor);\n return new TensorList(tensorList, elementShape,
dtype);\n }\n\n /**\n * Return a TensorList of the given size with empty elements.\n * @param elementShape the
shape of the future elements of the list\n * @param elementDType the desired type of elements in the list\n
* @param numElements the number of elements to reserve\n */\n export function reserve(\n elementShape:
number[], elementDType: DataType, numElements: number) {\n return new TensorList([], elementShape,
elementDType, numElements);\n }\n\n /**\n * Put tensors at specific indices of a stacked tensor into a TensorList.\n
* @param indices list of indices on how to scatter the tensor.\n * @param tensor input tensor.\n * @param
elementShape the shape of the future elements of the list\n * @param numElements the number of elements to
scatter\n */\n export function scatter(\n tensor: Tensor, indices: number[], elementShape: number[],\n
numElements?: number): TensorList {\n if (indices.length !== tensor.shape[0]) {\n throw new Error(`Expected
len(indices) == tensor.shape[0], but saw: ${\n indices.length} vs. ${tensor.shape[0]}`);\n }\n\n const maxIndex
= Math.max(...indices);\n if (numElements != null && numElements !== -1 && maxIndex >= numElements) {\n
throw new Error(\n `Max index must be < array size (${maxIndex} vs. ${numElements})`);\n }\n\n const list
= new TensorList([], elementShape, tensor.dtype, numElements);\n const tensors = unstack(tensor, 0);\n
indices.forEach((value, index) => {\n list.setItem(value, tensors[index]);\n });\n return list;\n }\n\n /**\n
* Split the

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values of a Tensor into a TensorList.\n * @param length the lengths to use when splitting value along\n * its first
dimension.\n * @param tensor the tensor to split.\n * @param elementShape the shape of the future elements of the
list\n */\nexport function split(\n tensor: Tensor, length: number[], elementShape: number[]) {\n let totalLength =
0;\n const cumulativeLengths = length.map(len => {\n totalLength += len;\n return totalLength;\n });\n\n if
(totalLength !== tensor.shape[0]) {\n throw new Error(`Expected sum of lengths to be equal to\n
tensor.shape[0], but sum of lengths is\n ${totalLength}, and tensor's shape is: ${tensor.shape}`);\n }\n\n const
shapeWithoutFirstDim = tensor.shape.slice(1);\n const outputElementShape =\n mergeElementShape(shapeWithoutFirstDim, elementShape);\n const elementPerRow = totalLength === 0 ? 0 :
tensor.size / totalLength;\n const tensors: Tensor[] = tidy(() => {\n const tensors = [];\n tensor = reshape(tensor,
[1, totalLength, elementPerRow]);\n for (let i = 0; i < length.length; ++i) {\n const previousLength = (i === 0)
? 0 : cumulativeLengths[i - 1];\n const indices = [0, previousLength, 0];\n const sizes = [1, length[i],
elementPerRow];\n tensors[i] = reshape(\n slice(tensor, indices, sizes), outputElementShape as number[]);\n
 }\n tensor.dispose();\n return tensors;\n });\n\n const list = new TensorList([], elementShape, tensor.dtype,
length.length);\n\n for (let i = 0; i < tensors.length; i++) {\n list.setItem(i, tensors[i]);\n }\n return
list;\n}\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {DataType, scalar, Tensor} from '@tensorflow/tfjs-core';\nimport {NamedTensorsMap} from
'../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {TensorArray} from
'../executor/tensor_array';\nimport {fromTensor, reserve, scatter, split} from '../executor/tensor_list';\nimport
{InternalOpAsyncExecutor, Node} from './types';\nimport {cloneTensor, getParamValue, getTensor} from
'./utils';\n\nexport const executeOp: InternalOpAsyncExecutor = async(\n node: Node, tensorMap:
NamedTensorsMap,\n context: ExecutionContext): Promise<Tensor[]> => {\n switch (node.op) {\n case 'If':\n case 'StatelessIf': {\n const thenFunc =\n getParamValue('thenBranch', node, tensorMap, context) as
string;\n const elseFunc =\n getParamValue('elseBranch', node, tensorMap, context) as string;\n const
cond = getParamValue('cond', node, tensorMap, context) as Tensor;\n const args = getParamValue('args', node,
tensorMap, context) as Tensor[];\n const condValue = await cond.data();\n if (condValue[0]) {\n return
context.functionMap[thenFunc].executeFunctionAsync(\n args, context.tensorArrayMap,
context.tensorListMap);\n } else {\n return context.functionMap[elseFunc].executeFunctionAsync(\n
args, context.tensorArrayMap, context.tensorListMap);\n }\n }\n case 'While':\n case 'StatelessWhile': {\n const bodyFunc =\n getParamValue('body', node, tensorMap, context) as string;\n const condFunc =\n getParamValue('cond', node, tensorMap, context) as string;\n const args = getParamValue('args', node,
tensorMap, context) as Tensor[];\n\n // Calculate the condition of the loop\n const condResult =\n (await
context.functionMap[condFunc].executeFunctionAsync(\n args, context.tensorArrayMap,
context.tensorListMap));\n const argIds = args.map(tensor => tensor.id);\n let condValue = await
condResult[0].data();\n // Dispose the intermediate tensors for condition function\n condResult.forEach(tensor
=> {\n if (!tensor.kept && argIds.indexOf(tensor.id) === -1) {\n tensor.dispose();\n }\n });\n\n let result: Tensor[] = args;\n\n while (condValue[0]) {\n // Record the previous result for intermediate tensor
tracking\n const origResult = result;\n // Execution the body of the loop\n result = await
context.functionMap[bodyFunc].executeFunctionAsync(\n result, context.tensorArrayMap,
context.tensorListMap);\n const resultIds = result.map(tensor => tensor.id);\n\n // Dispose the intermediate
tensor for body function that is not global\n // kept, not input/output of the body function\n origResult.forEach(tensor => {\n if (!tensor.kept && argIds.indexOf(tensor.id) === -1 &&\n
resultIds.indexOf(tensor.id) === -1) {\n tensor.dispose();\n }\n });\n\n // Recalculate the

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condition of the loop using the latest results.\n const condResult =\n (await
context.functionMap[condFunc].executeFunctionAsync(\n result, context.tensorArrayMap,
context.tensorListMap));\n condValue = await condResult[0].data();\n // Dispose the intermediate tensors
for condition function\n condResult.forEach(tensor => {\n if (!tensor.kept && argIds.indexOf(tensor.id)
=== -1 &&\n resultIds.indexOf(tensor.id) === -1) {\n tensor.dispose();\n }\n });\n return result;\n } \n case 'LoopCond': {\n const pred = getParamValue('pred', node, tensorMap, context) as
Tensor;\n return [cloneTensor(pred)];\n } \n case 'Switch': {\n const pred = getParamValue('pred', node,
tensorMap, context) as Tensor;\n let data = getParamValue('data', node, tensorMap, context) as Tensor;\n if
(!data.kept) {\n data = cloneTensor(data);\n } \n // Outputs nodes :0 => false, :1 => true\n return (await
pred.data())[0] ? [undefined, data] : [data, undefined];\n } \n case 'Merge': {\n const inputName =
node.inputNames.find(\n name => getTensor(name, tensorMap, context) !== undefined);\n if (inputName)
{\n const data = getTensor(inputName, tensorMap, context);\n return [cloneTensor(data)];\n }\n return undefined;\n } \n case 'Enter': {\n const frameId =\n getParamValue('frameName', node,
tensorMap, context) as string;\n const data = getParamValue('tensor', node, tensorMap, context) as Tensor;\n context.enterFrame(frameId);\n return [cloneTensor(data)];\n } \n case 'Exit': {\n const data =
getParamValue('tensor', node, tensorMap, context) as Tensor;\n context.exitFrame();\n return
[cloneTensor(data)];\n } \n case 'NextIteration': {\n const data = getParamValue('tensor', node, tensorMap,
context) as Tensor;\n context.nextIteration();\n return [cloneTensor(data)];\n } \n case 'TensorArrayV3':
{\n const size = getParamValue('size', node, tensorMap, context) as number;\n const dtype =\n getParamValue('dtype', node, tensorMap, context) as DataType;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const dynamicSize =\n getParamValue('dynamicSize', node, tensorMap, context) as boolean;\n const clearAfterRead =\n getParamValue('clearAfterRead', node, tensorMap, context) as boolean;\n const identicalElementShapes =\n getParamValue('identicalElementShapes', node, tensorMap, context) as\n boolean;\n const name =
getParamValue('name', node, tensorMap, context) as string;\n const tensorArray = new TensorArray(\n name, dtype, size, elementShape, identicalElementShapes, dynamicSize,\n clearAfterRead);\n context.addTensorArray(tensorArray);\n return [tensorArray.idTensor, scalar(1.0)];\n } \n case
'TensorArrayWriteV3': {\n const id =\n getParamValue('tensorArrayId', node, tensorMap, context) as
Tensor;\n const index = getParamValue('index', node, tensorMap, context) as number;\n const writeTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const writeTensorArray =
context.getTensorArray(id.id);\n writeTensorArray.write(index, writeTensor);\n return
[writeTensorArray.idTensor];\n } \n case 'TensorArrayReadV3': {\n const readId =\n getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n const readIndex =\n getParamValue('index', node, tensorMap, context) as number;\n const readTensorArray =
context.getTensorArray(readId.id);\n return [readTensorArray.read(readIndex)];\n } \n case
'TensorArrayGatherV3': {\n const gatherId =\n getParamValue('tensorArrayId', node, tensorMap, context)
as Tensor;\n const gatherIndices =\n getParamValue('indices', node, tensorMap, context) as number[];\n const gatherDType =\n getParamValue('dtype', node, tensorMap, context) as DataType;\n const
gatherTensorArray = context.getTensorArray(gatherId.id);\n return [gatherTensorArray.gather(gatherIndices,
gatherDType)];\n } \n case 'TensorArrayScatterV3': {\n const scatterId =\n getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n const scatterIndices =\n getParamValue('indices', node, tensorMap, context) as number[];\n const scatterTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const scatterTensorArray =
context.getTensorArray(scatterId.id);\n scatterTensorArray.scatter(scatterIndices, scatterTensor);\n return
[scatterTensorArray.idTensor];\n } \n case 'TensorArrayConcatV3': {\n const concatId =\n getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n const concatTensorArray =
context.getTensorArray(concatId.id);\n const concatDType =\n getParamValue('dtype', node, tensorMap,
context) as DataType;\n return [concatTensorArray.concat(concatDType)];\n } \n case 'TensorArraySplitV3':

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{\n const splitId =\n getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n const
splitTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const lengths =\n getParamValue('lengths', node, tensorMap, context) as number[];\n const splitTensorArray =
context.getTensorArray(splitId.id);\n splitTensorArray.split(lengths, splitTensor);\n return
[splitTensorArray.idTensor];\n } \n case 'TensorArraySizeV3': {\n const sizeId =\n getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n const sizeTensorArray =
context.getTensorArray(sizeId.id);\n return [scalar(sizeTensorArray.size(), 'int32')];\n } \n case
'TensorArrayCloseV3': {\n const closeId =\n getParamValue('tensorArrayId', node, tensorMap, context) as
Tensor;\n const closeTensorArray = context.getTensorArray(closeId.id);\n
closeTensorArray.clearAndClose();\n return [closeTensorArray.idTensor];\n } \n case 'TensorListSetItem': {\n
 const idTensor =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const index =
getParamValue('index', node, tensorMap, context) as number;\n const writeTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const tensorList =
context.getTensorList(idTensor.id);\n tensorList.setItem(index, writeTensor);\n return [tensorList.idTensor];\n
} \n case 'TensorListGetItem': {\n const idTensor =\n getParamValue('tensorListId', node, tensorMap,
context) as Tensor;\n const readIndex =\n getParamValue('index', node, tensorMap, context) as number;\n
const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n\n const
elementDType =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n const
tensorList = context.getTensorList(idTensor.id);\n return [tensorList.getItem(readIndex, elementShape,
elementDType)];\n } \n case 'TensorListScatterV2':\n case 'TensorListScatter': {\n const scatterIndices =\n getParamValue('indices', node, tensorMap, context) as number[];\n const scatterTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const numElements =\n getParamValue('numElements', node, tensorMap, context) as number;\n const tensorList =\n scatter(scatterTensor, scatterIndices, elementShape, numElements);\n context.addTensorList(tensorList);\n
return [tensorList.idTensor];\n } \n case 'TensorListReserve':\n case 'EmptyTensorList': {\n const
elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const
elementDtype =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n let
numElementsParam;\n if (node.op === 'TensorListReserve') {\n numElementsParam = 'numElements';\n
} else {\n numElementsParam = 'maxNumElements';\n } \n\n const numElements =\n getParamValue(numElementsParam, node, tensorMap, context) as number;\n\n const tensorList =
reserve(elementShape, elementDtype, numElements);\n context.addTensorList(tensorList);\n return
[tensorList.idTensor];\n } \n case 'TensorListGather': {\n const gatherId =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const gatherIndices =\n getParamValue('indices', node, tensorMap, context) as number[];\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const elementDtype =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n const tensorList =
context.getTensorList(gatherId.id);\n return [tensorList.gather(gatherIndices, elementDtype, elementShape)];\n
} \n case 'TensorListStack': {\n const idTensor =\n getParamValue('tensorListId', node, tensorMap,
context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as
number[];\n const elementDtype =\n getParamValue('elementDType', node, tensorMap, context) as
DataType;\n const numElements =\n getParamValue('numElements', node, tensorMap, context) as
number;\n const tensorList = context.getTensorList(idTensor.id);\n return [tensorList.stack(elementShape,
elementDtype, numElements)];\n } \n case 'TensorListFromTensor': {\n const tensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const elementDtype =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n const tensorList =
fromTensor(tensor, elementShape, elementDtype);\n context.addTensorList(tensorList);\n return

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[tensorList.idTensor];\n }\n case 'TensorListConcat': {\n const concatId =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const tensorList =\n context.getTensorList(concatId.id);\n const concatDType =\n getParamValue('dtype', node, tensorMap,\n context) as DataType;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context)\n as number[];\n return [tensorList.concat(concatDType, elementShape)];\n }\n case 'TensorListPushBack': {\n const idTensor =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const\n writeTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const tensorList =\n context.getTensorList(idTensor.id);\n tensorList.pushBack(writeTensor);\n return [tensorList.idTensor];\n }\n case 'TensorListPopBack': {\n const idTensor =\n getParamValue('tensorListId', node, tensorMap,\n context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as\n number[];\n const elementDType =\n getParamValue('elementDType', node, tensorMap, context) as\n DataType;\n const tensorList = context.getTensorList(idTensor.id);\n return\n [tensorList.popBack(elementShape, elementDType)];\n }\n case 'TensorListSplit': {\n const splitTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const lengths =\n getParamValue('lengths', node, tensorMap, context) as number[];\n const tensorList = split(splitTensor, lengths,\n elementShape);\n context.addTensorList(tensorList);\n return [tensorList.idTensor];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n };\n};\n\nexport const CATEGORY =\n'control';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

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=====\n\n*\n\nimport {Rank, Tensor, Tensor3D, Tensor4D, Tensor5D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport\n{NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from\n'../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\nimport {getPadding,\ngetParamValue} from './utils';\n\nfunction fusedConvAndDepthWiseParams(\n node: Node, tensorMap:\n NamedTensorsMap, context: ExecutionContext) {\n const [extraOp, activationFunc] =\n (getParamValue('fusedOps', node, tensorMap, context) as string[]);\n const isBiasAdd = extraOp === 'biasadd';\n const isPrelu = activationFunc === 'prelu';\n const isBatchNorm = extraOp === 'fusedbatchnorm';\n const\n numArgs =\n (getParamValue('numArgs', node, tensorMap, context) as number);\n if (isBiasAdd) {\n if\n (isPrelu && numArgs !== 2) {\n throw new Error(\n 'FusedConv2d and DepthwiseConv2d with BiasAdd\n and Prelu ' +\n 'must have two extra arguments: bias and alpha.);\n }\n if (!isPrelu && numArgs !== 1) {\n throw new Error(\n 'FusedConv2d and DepthwiseConv2d with BiasAdd must have ' +\n 'one extra\n argument: bias.);\n }\n }\n if (isBatchNorm) {\n throw new Error(\n 'FusedConv2d and DepthwiseConv2d\n with FusedBatchNorm is not supported.);\n }\n const stride = getParamValue('strides', node, tensorMap, context)\n as number[];\n const pad = getPadding(node, tensorMap, context);\n const dataFormat =\n (getParamValue('dataFormat', node, tensorMap, context) as string)\n .toUpperCase();\n const dilations =\n getParamValue('dilations', node, tensorMap, context) as number[];\n const [biasArg, preluArg] =\n getParamValue('args', node, tensorMap, context) as Tensor[];\n const leakyreluAlpha =\n getParamValue('leakyreluAlpha', node, tensorMap, context) as number;\n return {\n stride,\n pad,\n dataFormat,\n dilations,\n biasArg,\n preluArg,\n activationFunc,\n leakyreluAlpha\n };\n}\n\nexport const\nexecuteOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context:\n ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Conv1D': {\n const stride =\n

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getParamValue('stride', node, tensorMap, context) as number;\n const pad = getParamValue('pad', node,
tensorMap, context);\n const dataFormat =\n (getParamValue('dataFormat', node, tensorMap, context)
as string)\n .toUpperCase();\n const dilation =\n getParamValue('dilation', node, tensorMap,
context) as number;\n return [tfOps.conv1d(\n getParamValue('x', node, tensorMap, context) as
Tensor3D,\n getParamValue('filter', node, tensorMap, context) as Tensor3D,\n stride, pad as 'valid' |
'same', dataFormat as 'NWC' | 'NCW',\n dilation)];\n }\n case 'Conv2D': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getPadding(node,
tensorMap, context);\n const dataFormat =\n (getParamValue('dataFormat', node, tensorMap, context)
as string)\n .toUpperCase();\n const dilations =\n getParamValue('dilations', node,
tensorMap, context) as number[];\n return [tfOps.conv2d(\n getParamValue('x', node, tensorMap,
context) as Tensor3D | \n Tensor4D,\n getParamValue('filter', node, tensorMap, context) as
Tensor4D,\n [stride[1], stride[2]], pad as 'valid' | 'same',\n dataFormat as 'NHWC' | 'NCHW',
[dilations[1], dilations[2]]);\n }\n case '_FusedConv2D': {\n const {\n stride,\n pad,\n dataFormat,\n dilations,\n biasArg,\n preluArg,\n activationFunc,\n leakyreluAlpha\n } = fusedConvAndDepthWiseParams(node, tensorMap, context);\n return
[tfOps.fused.conv2d({\n x: getParamValue('x', node, tensorMap, context) as Tensor3D | \n Tensor4D,\n filter: getParamValue('filter', node, tensorMap, context) as\n Tensor4D,\n strides: [stride[1], stride[2]],\n pad: pad as 'valid' | 'same',\n dataFormat: dataFormat as 'NHWC' |
'NCHW',\n dilations: [dilations[1], dilations[2]],\n bias: biasArg,\n activation: activationFunc as
tfOps.fused.Activation,\n preluActivationWeights: preluArg,\n leakyreluAlpha\n })];\n }\n case 'FusedDepthwiseConv2dNative': {\n const {\n stride,\n pad,\n dataFormat,\n dilations,\n biasArg,\n preluArg,\n activationFunc,\n leakyreluAlpha,\n } =
fusedConvAndDepthWiseParams(node, tensorMap, context);\n return [tfOps.fused.depthwiseConv2d({\n x: getParamValue('x', node, tensorMap, context) as Tensor3D | \n Tensor4D,\n filter:
getParamValue('filter', node, tensorMap, context) as\n Tensor4D,\n strides: [stride[1], stride[2]],\n pad: pad as 'valid' | 'same',\n dataFormat: dataFormat as 'NHWC' | 'NCHW',\n dilations:
[dilations[1], dilations[2]],\n bias: biasArg,\n activation: activationFunc as
tfOps.fused.Activation,\n preluActivationWeights: preluArg,\n leakyreluAlpha\n })];\n }\n case
'Conv2DBackpropInput':\n case 'Conv2dTranspose': {\n const shape = getParamValue(\n 'outputShape', node, tensorMap,\n context) as [number, number, number] | \n [number,
number, number, number];\n const stride =\n getParamValue('strides', node, tensorMap, context) as
number[];\n const pad = getPadding(node, tensorMap, context);\n return [tfOps.conv2dTranspose(\n getParamValue('x', node, tensorMap, context) as Tensor3D | \n Tensor4D,\n getParamValue('filter', node, tensorMap, context) as Tensor4D,\n shape, [stride[1], stride[2]], pad as 'valid' |
'same')];\n }\n case 'DepthwiseConv2dNative':\n case 'DepthwiseConv2d': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getPadding(node,
tensorMap, context);\n const dilations =\n getParamValue('dilations', node, tensorMap, context) as
number[];\n const dataFormat =\n (getParamValue('dataFormat', node, tensorMap, context) as string)\n .toUpperCase();\n return [tfOps.depthwiseConv2d(\n getParamValue('input', node,
tensorMap, context) as Tensor3D | \n Tensor4D,\n getParamValue('filter', node, tensorMap,
context) as Tensor4D,\n [stride[1], stride[2]], pad as 'valid' | 'same',\n dataFormat as 'NHWC' |
'NCHW', [dilations[1], dilations[2]]);\n }\n case 'Conv3D': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node,
tensorMap, context);\n const dataFormat =\n (getParamValue('dataFormat', node, tensorMap, context)
as string)\n .toUpperCase();\n const dilations =\n getParamValue('dilations', node,
tensorMap, context) as number[];\n return [tfOps.conv3d(\n getParamValue('x', node, tensorMap,
context) as Tensor4D | \n Tensor<Rank.R5>,\n getParamValue('filter', node, tensorMap, context)
as\n Tensor<Rank.R5>,\n [stride[1], stride[2], stride[3]], pad as 'valid' | 'same',\n

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dataFormat as 'NDHWC' | 'NCDHW',\n [dilations[1], dilations[2], dilations[3]]);\n }\n case
'AvgPool': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as number[];\n return [tfOps.avgPool(\n getParamValue('x', node, tensorMap, context) as Tensor3D | \n Tensor4D,\n [kernelSize[1],\n kernelSize[2]], [stride[1], stride[2]],\n pad as 'valid' | 'same')));\n }\n case 'MaxPool': {\n const
stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad =
getParamValue('pad', node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize',\n node, tensorMap, context) as number[];\n return [tfOps.maxPool(\n getParamValue('x', node,\n tensorMap, context) as Tensor3D | \n Tensor4D,\n [kernelSize[1], kernelSize[2]], [stride[1],\n stride[2]],\n pad as 'valid' | 'same')));\n }\n case 'MaxPoolWithArgmax': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node,\n tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as\n number[];\n const includeBatchInIndex =\n getParamValue('includeBatchInIndex', node, tensorMap,\n context) as\n boolean;\n const {result, indexes} = tfOps.maxPoolWithArgmax(\n getParamValue('x', node, tensorMap, context) as Tensor4D,\n [kernelSize[1], kernelSize[2]], [stride[1],\n stride[2]],\n pad as 'valid' | 'same', includeBatchInIndex);\n return [result, indexes];\n }\n case
'AvgPool3D': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as number[];\n return [tfOps.avgPool3d(\n getParamValue('x', node, tensorMap, context) as Tensor5D,\n [kernelSize[1], kernelSize[2],\n kernelSize[3]],\n [stride[1], stride[2], stride[3]], pad as 'valid' | 'same')));\n }\n case 'MaxPool3D':\n {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad =\n getParamValue('pad', node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize',\n node, tensorMap, context) as number[];\n return [tfOps.maxPool3d(\n getParamValue('x', node,\n tensorMap, context) as Tensor5D,\n [kernelSize[1], kernelSize[2], kernelSize[3]],\n [stride[1],\n stride[2], stride[3]], pad as 'valid' | 'same')));\n }\n case 'Dilation2D': {\n const strides =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node,\n tensorMap, context);\n const dilations =\n getParamValue('dilations', node, tensorMap, context) as\n number[];\n // strides: [1, stride_height, stride_width, 1].\n const strideHeight = strides[1];\n const\n strideWidth = strides[2];\n // dilations: [1, dilation_height, dilation_width, 1].\n const dilationHeight =\n dilations[1];\n const dilationWidth = dilations[2];\n return [tfOps.dilation2d(\n getParamValue('x', node, tensorMap, context) as Tensor3D | \n Tensor4D,\n getParamValue('filter', node, tensorMap, context) as Tensor3D,\n [strideHeight, strideWidth], pad as 'valid' |\n 'same',\n [dilationHeight, dilationWidth], 'NHWC' /* dataFormat */);\n }\n }\n default:\n throw\n TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n}\n\nexport const CATEGORY =\n'convolution';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
=====
*\n\nimport {DataType, Tensor, Tensor1D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-\nfrom-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport\n{NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from\n '../executor/execution_context';\nimport {InternalOpExecutor, Node} from './types';\nimport {getParamValue}

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from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Fill': {\n const shape =\n getParamValue('shape', node, tensorMap, context) as number[];\n const dtype =\n getParamValue('dtype', node, tensorMap, context) as DataType;\n const value =\n getParamValue('value', node, tensorMap, context) as number;\n return [tfOps.fill(shape, value, dtype)];\n }\n case 'LinSpace': {\n const start =\n getParamValue('start', node, tensorMap, context) as\n number;\n const stop =\n getParamValue('stop', node, tensorMap, context) as number;\n const\n num = getParamValue('num', node, tensorMap, context) as number;\n return [tfOps.linspace(start, stop,\n num)];\n }\n case 'Multinomial': {\n const logits =\n getParamValue('logits', node, tensorMap,\n context) as Tensor1D;\n const numSamples =\n getParamValue('numSamples', node, tensorMap,\n context) as number;\n const seed =\n getParamValue('seed', node, tensorMap, context) as number;\n return [tfOps.multinomial(logits, numSamples, seed)];\n }\n case 'OneHot': {\n const indices =\n getParamValue('indices', node, tensorMap, context) as Tensor1D;\n const depth =\n getParamValue('depth', node, tensorMap, context) as number;\n const onValue =\n getParamValue('onValue', node, tensorMap, context) as number;\n const offValue =\n getParamValue('offValue', node, tensorMap, context) as number;\n return [tfOps.oneHot(indices, depth,\n onValue, offValue)];\n }\n case 'Ones': {\n return [tfOps.ones(\n getParamValue('shape',\n node, tensorMap, context) as number[],\n getParamValue('dtype', node, tensorMap, context) as\n DataType)];\n }\n case 'OnesLike': {\n return [tfOps.onesLike(\n getParamValue('x', node,\n tensorMap, context) as Tensor)];\n }\n case 'RandomUniform': {\n return [tfOps.randomUniform(\n // tslint:disable-next-line:no-any\n getParamValue('shape', node, tensorMap, context) as any,\n getParamValue('minval', node, tensorMap, context) as number,\n getParamValue('maxval', node,\n tensorMap, context) as number,\n getParamValue('dtype', node, tensorMap, context) as DataType)];\n }\n case 'Range': {\n const start =\n getParamValue('start', node, tensorMap, context) as number;\n const stop =\n getParamValue('stop', node, tensorMap, context) as number;\n const step =\n getParamValue('step', node, tensorMap, context) as number;\n return [tfOps.range(\n start, stop,\n step,\n getParamValue('dtype', node, tensorMap, context) as 'float32' |\n 'int32')];\n }\n case 'TruncatedNormal': {\n const shape =\n getParamValue('shape', node, tensorMap, context) as\n number[];\n const mean =\n getParamValue('mean', node, tensorMap, context) as number;\n const stdDev =\n getParamValue('stdDev', node, tensorMap, context) as number;\n const seed =\n getParamValue('seed', node, tensorMap, context) as number;\n return [tfOps.truncatedNormal(\n shape, mean, stdDev,\n getParamValue('dtype', node, tensorMap, context) as 'float32' |\n 'int32',\n seed)];\n }\n case 'Zeros': {\n return [tfOps.zeros(\n getParamValue('shape', node,\n tensorMap, context) as number[],\n getParamValue('dtype', node, tensorMap, context) as DataType)];\n }\n case 'ZerosLike': {\n return [tfOps.zerosLike(\n getParamValue('x', node, tensorMap, context)\n as Tensor)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'creation';\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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*\n\nimport {Tensor, Tensor1D, Tensor2D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport\n{NamedTensorsMap} from './data/types';\nimport {ExecutionContext} from\n'./../executor/execution_context';\nimport {InternalOpAsyncExecutor, Node} from './types';\nimport

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}\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'evaluation';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\nimport {cloneTensor, getParamValue, getTensor} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Const': {\n return tensorMap[node.name];\n }\n case 'PlaceholderWithDefault':\n const def =\n getParamValue('default', node, tensorMap, context) as Tensor;\n return [getTensor(node.name, tensorMap, context) || def];\n case 'Placeholder':\n return [getTensor(node.name, tensorMap, context)];\n case 'Identity':\n case 'StopGradient':\n case 'FakeQuantWithMinMaxVars': { // This op is currently ignored.\n const data = getParamValue('x', node, tensorMap, context) as Tensor;\n return [cloneTensor(data)];\n }\n case 'IdentityN':\n return (getParamValue('x', node, tensorMap, context) as Tensor[])\n .map((t: Tensor) => cloneTensor(t));\n case 'Snapshot':\n const snapshot =\n (getParamValue('x', node, tensorMap, context) as Tensor);\n return [cloneTensor(snapshot)];\n case 'Shape':\n return [tfOps.tensor1d(\n (getParamValue('x', node, tensorMap, context) as Tensor).shape,\n 'int32')];\n case 'ShapeN':\n return (getParamValue('x', node, tensorMap, context) as Tensor[])\n .map((t: Tensor) => tfOps.tensor1d(t.shape));\n case 'Size':\n return [tfOps.scalar(\n (getParamValue('x', node, tensorMap, context) as Tensor).size,\n 'int32')];\n case 'Rank':\n return [tfOps.scalar(\n (getParamValue('x', node, tensorMap, context) as Tensor).rank,\n 'int32')];\n case 'NoOp':\n return [tfOps.scalar(1)];\n case 'Print':\n const input = getParamValue('x', node, tensorMap, context) as Tensor;\n const data =\n getParamValue('data', node, tensorMap, context) as Tensor[];\n const message =\n getParamValue('message', node, tensorMap, context) as string;\n const summarize =\n getParamValue('summarize', node, tensorMap, context) as number;\n console.warn(\n 'The graph has a tf.print() operation, '+\n 'usually used for debugging, which slows down performance.);\n console.log(message);\n for (let i = 0; i < data.length; i++) {\n console.log(Array.prototype.slice.call(data[i].dataSync())\n .slice(0, summarize));\n }\n return [input];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'graph';\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {DataType, keep, scalar, stack, Tensor, tidy, unstack, util} from '@tensorflow/tfjs-core';\n\n/**\n * Hashtable contains a set of tensors, which can be accessed by key.\n */\nexport class HashTable {\n readonly handle: Tensor;\n // tslint:disable-next-line: no-any\n private tensorMap: Map<any, Tensor>;\n\n get id() {\n return this.handle.id;\n }\n\n /**\n * Constructor of HashTable. Creates a hash table.\n * @param

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```

keyDType `dtype` of the table keys.\n * @param valueDType `dtype` of the table values.\n */
constructor(readonly keyDType: DataType, readonly valueDType: DataType) {\n this.handle = scalar(0);\n // tslint:disable-next-line: no-any\n this.tensorMap = new Map<any, Tensor>();\n keep(this.handle);\n }\n\n/**\n * Dispose the tensors and handle and clear the hashtable.\n */\n clearAndClose() {\n this.tensorMap.forEach(value => value.dispose());\n this.tensorMap.clear();\n this.handle.dispose();\n }\n\n/**\n * The number of items in the hash table.\n */\n size(): number {\n return this.tensorMap.size;\n }\n\n/**\n * Replaces the contents of the table with the specified keys and values.\n * @param keys Keys to store in the hashtable.\n * @param values Values to store in the hashtable.\n */\n async import(keys: Tensor, values: Tensor): Promise<Tensor> {\n this.checkKeyAndValueTensor(keys, values);\n // We only store the primitive values of the keys, this allows lookup\n // to be O(1).\n const $keys = await keys.data();\n // Clear the hashTable before inserting new values.\n this.tensorMap.forEach(value => value.dispose());\n this.tensorMap.clear();\n return tidy(() => {\n const $values = unstack(values);\n const keysLength = $keys.length;\n const valuesLength = $values.length;\n util.assert(\n keysLength === valuesLength,\n () => `The number of elements doesn't match, keys has ` +\n `${keysLength} elements, the values has\n ${valuesLength} ` +\n `elements.`);\n for (let i = 0; i < keysLength; i++) {\n const key = $keys[i];\n const value = $values[i];\n keep(value);\n this.tensorMap.set(key, value);\n }\n return this.handle;\n });\n}\n\n/**\n * Looks up keys in a hash table, outputs the corresponding values.\n */\n * Performs batch lookups, for every element in the key tensor, `find`\n * stacks the corresponding value into the return tensor.\n * If an element is not present in the table, the given `defaultValue` is\n * used.\n * @param keys Keys to look up. Must have the same type as the keys of the\n * table.\n * @param defaultValue The scalar `defaultValue` is the value output for keys\n * not present in the table. It must also be of the same type as the\n * table values.\n */\n async find(keys: Tensor, defaultValue: Tensor): Promise<Tensor> {\n this.checkKeyAndValueTensor(keys, defaultValue);\n const $keys = await keys.data();\n return tidy(() => {\n const result: Tensor[] = [];\n for (let i = 0; i < $keys.length; i++) {\n const key = $keys[i];\n const value = this.findWithDefault(key, defaultValue);\n result.push(value);\n }\n return stack(result);\n });\n}\n\n// tslint:disable-next-line: no-any\n private findWithDefault(key: any, defaultValue: Tensor): Tensor {\n const result = this.tensorMap.get(key);\n return result != null ? result : defaultValue;\n }\n\n private checkKeyAndValueTensor(key: Tensor, value: Tensor) {\n if (key.dtype !== this.keyDType) {\n throw new Error(\n `Expect key dtype ${this.keyDType}, but got ` +\n `${key.dtype}`);\n }\n if (value.dtype !== this.valueDType) {\n throw new Error(\n `Expect value dtype ${this.valueDType}, but got ` +\n `${value.dtype}`);\n }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\n\nimport {DataType, Tensor} from '@tensorflow/tfjs-core';\nimport {NamedTensorsMap} from './../data/types';\nimport {ExecutionContext} from './../executor/execution_context';\nimport {HashTable} from './../executor/hash_table';\nimport {ResourceManager} from './../executor/resource_manager';\nimport {InternalOpAsyncExecutor, Node} from './types';\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpAsyncExecutor = async(\n node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext,\n resourceManager: ResourceManager): Promise<Tensor[]> => {\n switch (node.op) {\n case 'HashTable':\n case 'HashTableV2': {\n const keyDType =\n getParamValue('keyDType', node, tensorMap, context) as DataType;\n const valueDType =\n getParamValue('valueDType', node, tensorMap, context) as DataType;\n const hashTable = new HashTable(keyDType, valueDType);\n resourceManager.addHashTable(node.name, hashTable);\n return [hashTable.handle];\n }\n }\n}\n
```

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'LookupTableImport':\n case 'LookupTableImportV2': {\n const handle = getParamValue(\n
'tableHandle', node, tensorMap, context,\n resourceManager) as Tensor;\n const keys =
getParamValue('keys', node, tensorMap, context) as Tensor;\n const values =\n getParamValue('values',
node, tensorMap, context) as Tensor;\n\n const hashTable = resourceManager.getHashTableById(handle.id);\n
return [await hashTable.import(keys, values)];\n }\n case 'LookupTableFind':\n case 'LookupTableFindV2':
{\n const handle = getParamValue(\n 'tableHandle', node, tensorMap, context,\n resourceManager) as Tensor;\n const keys = getParamValue('keys', node, tensorMap, context) as Tensor;\n
const defaultValue =\n getParamValue('defaultValue', node, tensorMap, context) as Tensor;\n\n const
hashTable = resourceManager.getHashTableById(handle.id);\n return [await hashTable.find(keys,
defaultValue)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n
}\n};\n\nexport const CATEGORY = 'hash_table';\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All
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file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
*\n
=====\n
*\n\nimport {Tensor, Tensor1D, Tensor2D, Tensor3D, Tensor4D} from '@tensorflow/tfjs-core';\n// tslint:disable-
next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-
core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from '../data/types';\nimport
{ExecutionContext} from '../executor/execution_context';\nimport {InternalOpExecutor, Node} from
../types;\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node:
Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n
case 'ResizeBilinear': {\n const images =\n getParamValue('images', node, tensorMap, context) as
Tensor;\n const size =\n getParamValue('size', node, tensorMap, context) as number[];\n const
alignCorners =\n getParamValue('alignCorners', node, tensorMap, context) as\n boolean;\n
const halfPixelCenters =\n getParamValue('halfPixelCenters', node, tensorMap, context) as\n
boolean;\n return [tfOps.image.resizeBilinear(\n images as Tensor3D | Tensor4D, [size[0], size[1]],
alignCorners,\n halfPixelCenters)];\n }\n case 'ResizeNearestNeighbor': {\n const images =\n
getParamValue('images', node, tensorMap, context) as Tensor;\n const size =\n
getParamValue('size', node, tensorMap, context) as number[];\n const alignCorners =\n
getParamValue('alignCorners', node, tensorMap, context) as\n boolean;\n const halfPixelCenters =\n
getParamValue('halfPixelCenters', node, tensorMap, context) as\n boolean;\n return
[tfOps.image.resizeNearestNeighbor(\n images as Tensor3D | Tensor4D, [size[0], size[1]], alignCorners,\n
halfPixelCenters)];\n }\n case 'CropAndResize': {\n const image =\n
getParamValue('image', node, tensorMap, context) as Tensor;\n const boxes =\n
getParamValue('boxes', node, tensorMap, context) as Tensor;\n const boxInd =\n
getParamValue('boxInd', node, tensorMap, context) as Tensor;\n const cropSize =\n
getParamValue('cropSize', node, tensorMap, context) as number[];\n const method =\n
getParamValue('method', node, tensorMap, context) as string;\n const extrapolationValue =\n
getParamValue('extrapolationValue', node, tensorMap, context) as\n number;\n return
[tfOps.image.cropAndResize(\n image as Tensor4D, boxes as Tensor2D, boxInd as Tensor1D,\n
cropSize as [number, number], method as 'bilinear' | 'nearest',\n extrapolationValue)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n
}\n };\n\nexport const
CATEGORY = 'image';\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *
*\n * http://www.apache.org/licenses/LICENSE-2.0\n * *\n

```

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```
=====
*
import {Tensor} from '@tensorflow/tfjs-core';
// tslint:disable-next-line: no-imports-from-dist
import * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';
import {NamedTensorsMap} from './data/types';
import {ExecutionContext} from '../executor/execution_context';
import {InternalOpExecutor, Node} from './types';
import {getParamValue} from './utils';
export const executeOp: InternalOpExecutor =
(node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {
 switch (node.op) {
 case 'Equal':
 return [tfOps.equal(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'NotEqual':
 return [tfOps.notEqual(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'Greater':
 return [tfOps.greater(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'GreaterEqual':
 return [tfOps.greaterEqual(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'Less':
 return [tfOps.less(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'LessEqual':
 return [tfOps.lessEqual(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'LogicalAnd':
 return [tfOps.logicalAnd(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'LogicalNot':
 return [tfOps.logicalNot(getParamValue('a', node, tensorMap, context) as Tensor)];
 case 'LogicalOr':
 return [tfOps.logicalOr(getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'Select':
 case 'SelectV2':
 return [tfOps.where(getParamValue('condition', node, tensorMap, context) as Tensor,
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 default:
 throw TypeError(`Node type ${node.op} is not implemented`);
 }
};
export const CATEGORY = 'logical';
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 * software distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
=====
*
import {Tensor, Tensor2D} from '@tensorflow/tfjs-core';
// tslint:disable-next-line: no-imports-from-dist
import * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';
import {NamedTensorsMap} from './data/types';
import {ExecutionContext} from '../executor/execution_context';
import {InternalOpExecutor, Node} from './types';
import {getParamValue} from './utils';
export const executeOp: InternalOpExecutor =
(node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {
 switch (node.op) {
 case 'BatchMatMul':
 case 'BatchMatMulV2':
 case 'MatMul':
 return [tfOps.matMul(getParamValue('a', node, tensorMap, context) as Tensor2D,
 getParamValue('b', node, tensorMap, context) as Tensor2D,
 getParamValue('transposeA', node, tensorMap, context) as boolean,
 getParamValue('transposeB', node, tensorMap, context) as boolean)];
 case 'Transpose':
 return [tfOps.transpose(getParamValue('x', node, tensorMap, context) as Tensor,
 getParamValue('perm', node, tensorMap, context) as number[])];
 case
```



```
as\n Scalar);\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'normalization';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\nimport {Tensor, Tensor1D, Tensor2D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {InternalOpExecutor, Node} from './types';\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Max': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n const keepDims =\n getParamValue('keepDims', node, tensorMap, context) as boolean;\n return [tfOps.max(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n keepDims)];\n }\n case 'Mean': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n const keepDims =\n getParamValue('keepDims', node, tensorMap, context) as boolean;\n return [tfOps.mean(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n keepDims)];\n }\n case 'Min': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n const keepDims =\n getParamValue('keepDims', node, tensorMap, context) as boolean;\n return [tfOps.min(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n keepDims)];\n }\n case 'Sum': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n const keepDims =\n getParamValue('keepDims', node, tensorMap, context) as boolean;\n return [tfOps.sum(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n keepDims)];\n }\n case 'All': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n const keepDims =\n getParamValue('keepDims', node, tensorMap, context) as boolean;\n return [tfOps.all(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n keepDims)];\n }\n case 'Any': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n const keepDims =\n getParamValue('keepDims', node, tensorMap, context) as boolean;\n return [tfOps.any(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n keepDims)];\n }\n case 'ArgMax': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n return [tfOps.argmax(\n getParamValue('x', node, tensorMap, context) as Tensor, axis)];\n }\n case 'ArgMin': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n return [tfOps.argmin(\n getParamValue('x', node, tensorMap, context) as Tensor, axis)];\n }\n case 'Prod': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n const keepDims =\n getParamValue('keepDims', node, tensorMap, context) as boolean;\n return [tfOps.prod(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n keepDims)];\n }\n case 'Cumsum': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n const exclusive =\n getParamValue('exclusive', node, tensorMap, context) as boolean;\n const reverse =\n getParamValue('reverse', node, tensorMap, context) as boolean;\n return [tfOps.cumsum(\n getParamValue('x', node, tensorMap, context) as Tensor, axis,\n exclusive, reverse)];\n }\n case 'Bincount': {\n const x = getParamValue('x', node, tensorMap, context) as Tensor1D;\n const weights =\n getParamValue('weights', node, tensorMap, context) as Tensor1D;\n const size =\n getParamValue('size', node, tensorMap, context) as number;\n return [tfOps.bincount(x, weights, size)];\n }\n case 'DenseBincount': {\n const x = getParamValue('x', node,
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tensorMap, context) as Tensor1D | \n Tensor2D; \n const weights = \n getParamValue('weights',
node, tensorMap, context) as Tensor1D | \n Tensor2D; \n const size = \n getParamValue('size',
node, tensorMap, context) as number; \n \n const binaryOutput = \n getParamValue('binaryOutput',
node, tensorMap, context) as \n boolean; \n \n return [tfOps.denseBincount(x, weights, size,
binaryOutput)]; \n } \n default: \n throw TypeError(`Node type ${node.op} is not implemented`); \n
} \n }; \n \n export const CATEGORY = 'reduction'; \n "/* * \n * @license \n * Copyright 2018 Google LLC. All
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file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n *
http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or agreed to in writing,
software \n * distributed under the License is distributed on an "AS IS" BASIS, \n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language
governing permissions and \n * limitations under the License. \n *

```

```

===== \n
* \n \n import { Scalar, Tensor, Tensor1D, tidy, util } from '@tensorflow/tfjs-core'; \n // tslint:disable-next-line: no-
imports-from-dist \n import * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter'; \n \n import
{NamedTensorsMap} from '../data/types'; \n import {ExecutionContext} from
'../executor/execution_context'; \n import {InternalOpExecutor, Node} from './types'; \n \n import {getParamValue}
from './utils'; \n \n export const executeOp: InternalOpExecutor = \n (node: Node, tensorMap: NamedTensorsMap, \n
context: ExecutionContext): Tensor[] => { \n switch (node.op) { \n case 'ConcatV2': \n case 'Concat': { \n
const n = getParamValue('n', node, tensorMap, context) as number; \n const axis = \n
getParamValue('axis', node, tensorMap, context) as number; \n let inputs = \n getParamValue('tensors',
node, tensorMap, context) as Tensor[]; \n inputs = inputs.slice(0, n); \n return [tfOps.concat(inputs,
axis)]; \n } \n case 'Gather': { \n const input = getParamValue('x', node, tensorMap, context) as
Tensor; \n const indices = \n getParamValue('indices', node, tensorMap, context) as Tensor1D; \n
return [tfOps.gather(input, tfOps.cast(indices, 'int32'), 0)]; \n } \n case 'GatherV2': { \n const axis = \n
getParamValue('axis', node, tensorMap, context) as number; \n const batchDims = \n
getParamValue('batchDims', node, tensorMap, context) as number; \n const input = getParamValue('x', node,
tensorMap, context) as Tensor; \n const indices = \n getParamValue('indices', node, tensorMap, context)
as Tensor1D; \n return [tfOps.gather(\n input, tfOps.cast(indices, 'int32'), axis, batchDims)]; \n } \n
case 'Reverse': { \n const dims = \n getParamValue('dims', node, tensorMap, context) as boolean[]; \n
const axis = []; \n for (let i = 0; i < dims.length; i++) { \n if (dims[i]) { \n axis.push(i); \n
} \n } \n const input = getParamValue('x', node, tensorMap, context) as Tensor; \n return
[tfOps.reverse(input, axis)]; \n } \n case 'ReverseV2': { \n const axis = \n getParamValue('axis',
node, tensorMap, context) as number[]; \n const input = getParamValue('x', node, tensorMap, context) as
Tensor; \n return [tfOps.reverse(input, axis)]; \n } \n case 'Slice': { \n // tslint:disable-next-line:no-
any \n const begin = getParamValue('begin', node, tensorMap, context) as any; \n // tslint:disable-next-
line:no-any \n const size = getParamValue('size', node, tensorMap, context) as any; \n return
[tfOps.slice(\n getParamValue('x', node, tensorMap, context) as Tensor, begin, \n size)]; \n } \n
case 'StridedSlice': { \n const begin = \n getParamValue('begin', node, tensorMap, context) as
number[]; \n const end = \n getParamValue('end', node, tensorMap, context) as number[]; \n const
strides = \n getParamValue('strides', node, tensorMap, context) as number[]; \n const beginMask = \n
getParamValue('beginMask', node, tensorMap, context) as number; \n const endMask = \n
getParamValue('endMask', node, tensorMap, context) as number; \n const ellipsisMask = \n
getParamValue('ellipsisMask', node, tensorMap, context) as number; \n const newAxisMask = \n
getParamValue('newAxisMask', node, tensorMap, context) as number; \n const shrinkAxisMask = \n
getParamValue('shrinkAxisMask', node, tensorMap, context) as \n number; \n const tensor = \n
getParamValue('x', node, tensorMap, context) as Tensor; \n return [tfOps.stridedSlice(\n tensor,
begin, end, strides, beginMask, endMask, ellipsisMask, \n newAxisMask, shrinkAxisMask)]; \n } \n
} \n

```



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case 'Pack': {\n return tidy() => {\n const axis =\n getParamValue('axis', node, tensorMap,
context) as number;\n const tensors =\n getParamValue('tensors', node, tensorMap, context) as
Tensor[];\n // Reshape the tensors to the first tensor's shape if they don't\n // match.\n const
shape = tensors[0].shape;\n const squeezedShape = tfOps.squeeze(tensors[0]).shape;\n const mapped =
tensors.map(tensor => {\n const sameShape = util.arraysEqual(tensor.shape, shape);\n if
(!sameShape &&\n !util.arraysEqual(\n tfOps.squeeze(tensor).shape, squeezedShape)) {\n
 throw new Error('the input tensors shape does not match');\n }\n return sameShape ? tensor :
tfOps.reshape(tensor, shape);\n });\n return [tfOps.stack(mapped, axis)];\n });\n }\n case
'Unpack': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n const
tensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n return tfOps.unstack(tensor,
axis);\n }\n case 'Tile': {\n const reps =\n getParamValue('reps', node, tensorMap, context) as
number[];\n return [tfOps.tile(\n getParamValue('x', node, tensorMap, context) as Tensor, reps)];\n }\n case 'Split':\n case 'SplitV': {\n const axis =\n getParamValue('axis', node, tensorMap,
context) as number;\n const numOrSizeSplits =\n getParamValue('numOrSizeSplits', node, tensorMap,
context) as\n number |\n number[];\n const tensor = getParamValue('x', node, tensorMap,
context) as Tensor;\n return tfOps.split(tensor, numOrSizeSplits, axis);\n }\n case 'ScatterNd': {\n
 const indices =\n getParamValue('indices', node, tensorMap, context) as Tensor;\n const values =\n getParamValue('values', node, tensorMap, context) as Tensor;\n const shape =\n getParamValue('shape', node, tensorMap, context) as number[];\n return [tfOps.scatterND(indices, values,
shape)];\n }\n case 'GatherNd': {\n const x = getParamValue('x', node, tensorMap, context) as
Tensor;\n const indices =\n getParamValue('indices', node, tensorMap, context) as Tensor;\n return [tfOps.gatherND(x, indices)];\n }\n case 'SparseToDense': {\n const indices =\n getParamValue('sparseIndices', node, tensorMap, context) as\n Tensor;\n const shape =\n getParamValue('outputShape', node, tensorMap, context) as\n number[];\n const sparseValues =\n getParamValue('sparseValues', node, tensorMap, context) as Tensor;\n const defaultValue =\n getParamValue('defaultValue', node, tensorMap, context) as Scalar;\n return [tfOps.sparseToDense(\n indices, sparseValues, shape,\n sparseValues.dtype === defaultValue.dtype ?\n defaultValue :\n tfOps.cast(defaultValue, sparseValues.dtype))];\n }\n default:\n throw TypeError('Node type
${node.op} is not implemented');\n }\n };\n\nexport const CATEGORY = 'slice_join';\n\n/**\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as
tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from
'../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {InternalOpExecutor,
Node} from '../types';\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n(node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext):\n Tensor[] => {\n switch
(node.op) {\n case 'FFT': {\n return [tfOps.fft(\n getParamValue('x', node, tensorMap,
context) as Tensor)];\n }\n case 'IFFT': {\n return [tfOps.ifft(\n getParamValue('x',
node, tensorMap, context) as Tensor)];\n }\n case 'RFFT': {\n return [tfOps.rfft(\n
 getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'IRFFT': {\n return
[tfOps.irfft(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n default:\n throw TypeError('Node type ${node.op} is not implemented');\n }\n };\n\nexport const CATEGORY
= 'spectral';\n\n/**\n * @license\n *
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*
import {Tensor, Tensor4D} from '@tensorflow/tfjs-core';
// tslint:disable-next-line: no-imports-from-dist
import * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';
import {NamedTensorsMap} from '../data/types';
import {ExecutionContext} from '../executor/execution_context';
import {InternalOpExecutor, Node} from './types';
import {getParamValue} from './utils';
export const executeOp: InternalOpExecutor = (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {
 switch (node.op) {
 case 'Cast': {
 return [tfOps.cast(getParamValue('x', node, tensorMap, context) as Tensor, getParamValue('dtype', node, tensorMap, context) as 'int32' | 'float32' | 'bool')];
 }
 case 'ExpandDims': {
 const axis = getParamValue('axis', node, tensorMap, context) as number;
 return [tfOps.expandDims(getParamValue('x', node, tensorMap, context) as Tensor, axis)];
 }
 case 'Squeeze': {
 const axis = getParamValue('axis', node, tensorMap, context) as number[];
 return [tfOps.squeeze(getParamValue('x', node, tensorMap, context) as Tensor, axis)];
 }
 case 'Reshape': {
 return [tfOps.reshape(getParamValue('x', node, tensorMap, context) as Tensor, getParamValue('shape', node, tensorMap, context) as number[])];
 }
 case 'MirrorPad': {
 return [tfOps.mirrorPad(getParamValue('x', node, tensorMap, context) as Tensor, getParamValue('padding', node, tensorMap, context) as Array<[number, number]>, getParamValue('mode', node, tensorMap, context) as 'reflect' | 'symmetric')];
 }
 case 'PadV2':
 case 'Pad': {
 return [tfOps.pad(getParamValue('x', node, tensorMap, context) as Tensor, getParamValue('padding', node, tensorMap, context) as Array<[number, number]>, getParamValue('constantValue', node, tensorMap, context) as number)];
 }
 case 'SpaceToBatchND': {
 const blockSize = getParamValue('blockShape', node, tensorMap, context) as number[];
 const paddings = getParamValue('paddings', node, tensorMap, context) as number[][];
 return [tfOps.spaceToBatchND(getParamValue('x', node, tensorMap, context) as Tensor, blockSize, paddings)];
 }
 case 'BatchToSpaceND': {
 const blockSize = getParamValue('blockShape', node, tensorMap, context) as number[];
 const crops = getParamValue('crops', node, tensorMap, context) as number[][];
 return [tfOps.batchToSpaceND(getParamValue('x', node, tensorMap, context) as Tensor, blockSize, crops)];
 }
 case 'DepthToSpace': {
 const blockSize = getParamValue('blockSize', node, tensorMap, context) as number;
 const dataFormat = (getParamValue('dataFormat', node, tensorMap, context) as string).toUpperCase() as 'NHWC' | 'NCHW';
 return [tfOps.depthToSpace(getParamValue('x', node, tensorMap, context) as Tensor4D, blockSize, dataFormat)];
 }
 case 'BroadcastTo': {
 return [tfOps.broadcastTo(getParamValue('x', node, tensorMap, context) as Tensor, getParamValue('shape', node, tensorMap, context) as number[])];
 }
 default:
 throw TypeError(`Node type ${node.op} is not implemented`);
 }
};
export const CATEGORY = 'transformation';
/**
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 * software distributed under the License is distributed
 * on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
 * either express or implied.
 * See the License for the specific language governing
 * permissions and limitations under the License.
 */
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*\n\nimport * as tfc from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from './data/types';\n\nimport {ExecutionContext} from './executor/execution_context';\n\nimport {ResourceManager} from './executor/resource_manager';\n\nimport {NodeValueImpl} from './custom_op/node_value_impl';\n\nimport {getRegisteredOp} from './custom_op/register';\n\nimport * as arithmetic from './executors/arithmetic_executor';\n\nimport * as basicMath from './executors/basic_math_executor';\n\nimport * as control from './executors/control_executor';\n\nimport * as convolution from './executors/convolution_executor';\n\nimport * as creation from './executors/creation_executor';\n\nimport * as dynamic from './executors/dynamic_executor';\n\nimport * as evaluation from './executors/evaluation_executor';\n\nimport * as graph from './executors/graph_executor';\n\nimport * as hashTable from './executors/hash_table_executor';\n\nimport * as image from './executors/image_executor';\n\nimport * as logical from './executors/logical_executor';\n\nimport * as matrices from './executors/matrices_executor';\n\nimport * as normalization from './executors/normalization_executor';\n\nimport * as reduction from './executors/reduction_executor';\n\nimport * as sliceJoin from './executors/slice_join_executor';\n\nimport * as spectral from './executors/spectral_executor';\n\nimport * as transformation from './executors/transformation_executor';\n\nimport {Node} from './types';\n\n/**\n * Executes the op defined by the node object.\n * @param node\n * @param tensorMap contains tensors for executed nodes and weights\n * @param context contains tensors and information for running the current node.\n * @param resourceManager Optional. Contains global resources of the model.\n */\nexport function executeOp(\n node: Node,\n tensorMap: NamedTensorsMap,\n context: ExecutionContext,\n resourceManager?: ResourceManager): tfc.Tensor[]\n Promise<tfc.Tensor[]> {\n const value = (\n (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext) => {\n switch (node.category) {\n case 'arithmetic':\n return tfc.tidy(\n () => arithmetic.executeOp(node, tensorMap, context));\n case 'basic_math':\n return tfc.tidy(\n () => basicMath.executeOp(node, tensorMap, context));\n case 'control':\n return control.executeOp(node, tensorMap, context);\n case 'convolution':\n return tfc.tidy(\n () => convolution.executeOp(node, tensorMap, context));\n case 'creation':\n return tfc.tidy(\n () => creation.executeOp(node, tensorMap, context));\n case 'dynamic':\n return dynamic.executeOp(node, tensorMap, context);\n case 'evaluation':\n return tfc.tidy(\n () => evaluation.executeOp(node, tensorMap, context));\n case 'image':\n return tfc.tidy(\n () => image.executeOp(node, tensorMap, context));\n case 'graph':\n return tfc.tidy(\n () => graph.executeOp(node, tensorMap, context));\n case 'logical':\n return tfc.tidy(\n () => logical.executeOp(node, tensorMap, context));\n case 'matrices':\n return tfc.tidy(\n () => matrices.executeOp(node, tensorMap, context));\n case 'normalization':\n return tfc.tidy(\n () => normalization.executeOp(node, tensorMap, context));\n case 'reduction':\n return tfc.tidy(\n () => reduction.executeOp(node, tensorMap, context));\n case 'slice_join':\n return tfc.tidy(\n () => sliceJoin.executeOp(node, tensorMap, context));\n case 'spectral':\n return tfc.tidy(\n () => spectral.executeOp(node, tensorMap, context));\n case 'transformation':\n return tfc.tidy(\n () => transformation.executeOp(node, tensorMap, context));\n case 'hash_table':\n return hashTable.executeOp(\n node, tensorMap, context, resourceManager);\n case 'custom':\n const opMapper = getRegisteredOp(node.op);\n if (opMapper && opMapper.customExecutor) {\n return opMapper.customExecutor(\n new NodeValueImpl(node, tensorMap, context));\n } else {\n throw TypeError(`Custom op ${node.op} is not registered.`);\n }\n default:\n throw TypeError(\n `Unknown op '${node.op}'. File an issue at ` +\n `https://github.com/tensorflow/tfjs/issues so we can add it` +\n `, or register a custom execution with ` +\n `tf.registerOp()`);\n }\n }\n })(node, tensorMap, context);\n if (tfc.util.isPromise(value)) {\n return (value as Promise<tfc.Tensor>).then((data) => [].concat(data));\n }\n return [].concat(value);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS.\n */

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*\nimport {Tensor} from '@tensorflow/tfjs-core';\nimport {NamedTensorsMap, TensorArrayMap,
TensorListMap} from './data/types';\nimport {TensorArray} from './tensor_array';\nimport {TensorList} from
 './tensor_list';\nimport {FunctionExecutor} from './types';\nexport interface ExecutionContextInfo {\n id: number;
 // the unique id of the context info\n frameName: string; // The frame name of the loop, this comes from\n
 // the TensorFlow NodeDef.\n iterationId: number; // The iteration id of the loop\n\n}\n\n*\n *
ExecutionContext captures the runtime environment of the node. It keeps\n * track of the current frame and iteration
for the control flow ops.\n * For example, typical Dynamic RNN model may contain loops, for which\n *
TensorFlow will generate graphs with Enter/Exit nodes to control the\n * current execution frame, and NextIteration
Nodes for iteration id increment.\n * For model with branch logic, TensorFlow will generate Switch/Merge ops.\n
*\n\nexport class ExecutionContext {\n private rootContext = {id: 0, frameName: "", iterationId: 0};\n private
contexts: ExecutionContextInfo[] = [this.rootContext];\n private lastId = 0;\n private _currentContextIds:
string[];\n\n constructor(\n readonly weightMap: NamedTensorsMap = {},\n readonly tensorArrayMap:
TensorArrayMap = {},\n readonly tensorListMap: TensorListMap = {},\n readonly functionMap: {[key:
string]: FunctionExecutor} = {}) {\n this.generateCurrentContextIds();\n }\n\n private newFrame(id: number,
frameName: string) {\n return {id, frameName, iterationId: 0};\n }\n\n /**\n * Set the current context\n *
@param contexts: ExecutionContextInfo[] the current path of execution\n * frames\n * set
currentContext(contexts: ExecutionContextInfo[]) {\n if (this.contexts !== contexts) {\n this.contexts =
contexts;\n this.generateCurrentContextIds();\n }\n }\n\n get currentContext(): ExecutionContextInfo[] {\n
return this.contexts;\n }\n\n /**\n * Returns the current context in string format.\n *\n get currentContextId():
string {\n return this._currentContextIds[0];\n }\n\n /**\n * Returns the current context and all parent contexts
in string format.\n * This allow access to the nodes in the current and parent frames.\n *\n get
currentContextIds(): string[] {\n return this._currentContextIds;\n }\n\n private generateCurrentContextIds() {\n
const names = [];\n for (let i = 0; i < this.contexts.length - 1; i++) {\n const contexts = this.contexts.slice(0,
this.contexts.length - i);\n names.push(this.contextIdforContexts(contexts));\n }\n names.push("");\n
this._currentContextIds = names;\n }\n\n private contextIdforContexts(contexts: ExecutionContextInfo[]) {\n
return contexts ?\n contexts\n .map(\n context => (context.id === 0 && context.iterationId ===
0) ?\n ""\n :`\${context.frameName}-${context.iterationId}`)\n .join("/") :\n "";\n }\n\n /**\n * Enter a new frame, a new context is pushed on the current context list.\n * @param frameId new
frame id\n *\n enterFrame(frameId: string) {\n if (this.contexts) {\n this.lastId++;\n this.contexts =
this.contexts.slice();\n this.contexts.push(this.newFrame(this.lastId, frameId));\n
this._currentContextIds.unshift(this.contextIdforContexts(this.contexts));\n }\n }\n\n /**\n * Exit the current
frame, the last context is removed from the current\n * context list.\n *\n exitFrame() {\n if (this.contexts &&
this.contexts.length > 1) {\n this.contexts = this.contexts.slice();\n this.contexts.splice(-1);\n
this.currentContextIds.shift();\n } else {\n throw new Error('Cannot exit frame, the context is empty');\n }\n }\n\n /**\n * Enter the next iteration of a loop, the iteration id of last context is\n * increased.\n *\n
nextIteration() {\n if (this.contexts && this.contexts.length > 0) {\n this.contexts = this.contexts.slice();\n
this.lastId++;\n const context =\n Object.assign({}, this.contexts[this.contexts.length - 1]);\n
context.iterationId += 1;\n context.id = this.lastId;\n this.contexts.splice(-1, 1, context);\n
this._currentContextIds.splice(\n 0, 1, this.contextIdforContexts(this.contexts));\n } else {\n throw new
Error('Cannot increase frame iteration, the context is empty');\n }\n }\n\n getWeight(name: string): Tensor[] {\n
return this.weightMap[name];\n }\n\n addTensorArray(tensorArray: TensorArray) {\n
this.tensorArrayMap[tensorArray.id] = tensorArray;\n }\n\n getTensorArray(id: number): TensorArray {\n return
this.tensorArrayMap[id];\n }\n\n addTensorList(tensorList: TensorList) {\n this.tensorListMap[tensorList.id] =
tensorList;\n }\n\n getTensorList(id: number): TensorList {\n return this.tensorListMap[id];\n }\n\n
dispose(keepIds: Set<number>) {\n for (const key in this.tensorArrayMap) {\n
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this.tensorArrayMap[key].clearAndClose(keepIds);\n } \n\n for (const key in this.tensorListMap) {\n this.tensorListMap[key].clearAndClose(keepIds);\n } \n } \n } \n", "/\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*/

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*\n\nimport {NamedTensorMap} from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from './data/types';\n\nimport {parseNodeName} from './operations/executors/utils';\n\nimport {Graph, Node} from './operations/types';\n\nexport interface ExecutionInfo {\n inputs: NamedTensorMap;\n outputs: Node[];\n usedNodes: Set<string>;\n missingInputs: string[];\n dynamicNode: Node;\n syncInputs: string[];\n}\n\n/**\n * Given graph inputs and desired outputs, find the minimal set of nodes\n * to execute in order to compute the outputs. In addition return other useful\n * info such:\n * - Missing inputs needed to compute the output.\n * - Whether the subgraph contains dynamic ops (control flow, dynamic shape).\n * - Alternative inputs in order to avoid async (dynamic op) execution.\n */\nexport function getExecutionSubgraph(\n inputs: NamedTensorMap, outputs: Node[], weightMap: NamedTensorsMap,\n initNodes?: Node[]): ExecutionInfo {\n const usedNodes = new Set<string>();\n const missingInputs: string[] = [];\n let dynamicNode: Node = null;\n let syncInputs: string[] = null;\n\n // Start with the outputs, going backwards and find all the nodes that are\n // needed to compute those outputs.\n const seen = new Set<string>();\n const inputNodeNames =\n Object.keys(inputs).map(name => parseNodeName(name)[0]);\n\n let initNodeNames: string[] = [];\n if (initNodes != null) {\n initNodeNames = initNodes.map(node => parseNodeName(node.name)[0]);\n }\n\n const frontier = [...outputs];\n while (frontier.length > 0) {\n const node = frontier.pop();\n if (isControlFlow(node) || isDynamicShape(node) || isHashTable(node)) {\n if (dynamicNode == null) {\n dynamicNode = node;\n syncInputs = dynamicNode.children.map(child => child.name)\n .filter(name => usedNodes.has(name));\n }\n\n usedNodes.add(node.name);\n\n // Weights are dead end since we already have their values.\n if (weightMap[node.name] != null) {\n continue;\n }\n\n // This node is a dead end since it's one of the user-provided inputs.\n if (inputNodeNames.indexOf(node.name) !== -1) {\n continue;\n }\n\n // This node is a dead end since it doesn't have any inputs.\n if (initNodeNames.indexOf(node.name) !== -1) {\n continue;\n }\n\n if (node.inputs.length === 0) {\n missingInputs.push(node.name);\n continue;\n }\n\n node.inputs.forEach(input => {\n // Don't add to the frontier if it is already there.\n if (seen.has(input.name)) {\n return;\n }\n seen.add(input.name);\n frontier.push(input);\n });\n }\n\n return {inputs, outputs, usedNodes, missingInputs, dynamicNode, syncInputs};\n }\n\n /**\n * Given the execution info, return a list of nodes in topological order that\n * need to be executed to compute the output.\n */\n export function\n getNodesInTopologicalOrder(\n graph: Graph, weightMap: NamedTensorsMap, executionInfo:\n ExecutionInfo): Node[] {\n const {usedNodes, inputs} = executionInfo;\n const frontier: Node[] = [];\n const inputNodes = Object.keys(inputs)\n .map(name => parseNodeName(name)[0])\n .map(name => graph.nodes[name]);\n const initNodes = graph.initNodes;\n\n inputNodes.forEach(input => {\n if (usedNodes.has(input.name)) {\n frontier.push(input);\n }\n });\n\n graph.weights.forEach(weight => {\n if (usedNodes.has(weight.name)) {\n frontier.push(weight);\n }\n });\n\n if (initNodes != null) {\n initNodes.forEach(node => {\n if (usedNodes.has(node.name)) {\n frontier.push(node);\n }\n });\n }\n\n const seen = new Set<string>();\n const orderedNodes: Node[] = [];\n while (frontier.length > 0) {\n const node =\n frontier.pop();\n seen.add(node.name);\n if (!weightMap[node.name]) {\n orderedNodes.push(node);\n }\n\n node.children.forEach(child => {\n if (!seen.has(child.name) && usedNodes.has(child.name) &&\n child.inputs.every(input => seen.has(input.name))) {\n frontier.push(child);\n }\n });\n }\n\n return orderedNodes;\n }\n\n const CONTROL_FLOW_OPS = [\n 'Switch', 'Merge', 'Enter', 'Exit', 'NextIteration', 'StatelessIf',\n 'StatelessWhile', 'if', 'While'];\n\n const DYNAMIC_SHAPE_OPS = [\n 'NonMaxSuppressionV2',

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'NonMaxSuppressionV3', 'NonMaxSuppressionV5', 'Where'\n);\nconst HASH_TABLE_OPS = [\n 'HashTable',
'HashTableV2', 'LookupTableImport', 'LookupTableImportV2',\n 'LookupTableFind',
'LookupTableFindV2'\n];\n\nexport function isControlFlow(node: Node) {\n return
CONTROL_FLOW_OPS.indexOf(node.op) >= 0;\n}\n\nexport function isDynamicShape(node: Node) {\n return
DYNAMIC_SHAPE_OPS.indexOf(node.op) >= 0;\n}\n\nexport function isHashTable(node: Node) {\n return
HASH_TABLE_OPS.indexOf(node.op) >= 0;\n}\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\n\nimport {DataType, NamedTensorMap, Tensor, tidy, util} from '@tensorflow/tfjs-core';\n\nimport
{ISignatureDef} from './data/compiled_api';\n\nimport {NamedTensorsMap, TensorArrayMap, TensorInfo,
TensorListMap} from './data/types';\n\nimport {getNodeNameAndIndex, getParamValue, getTensor,
getTensorsForCurrentContext, parseNodeName} from './operations/executors/utils';\n\nimport {executeOp} from
'./operations/operation_executor';\n\nimport {Graph, Node} from './operations/types';\n\nimport {ExecutionContext,
ExecutionContextInfo} from './execution_context';\n\nimport {getExecutionSubgraph, getNodesInTopologicalOrder,
isControlFlow} from './model_analysis';\n\nimport {ResourceManager} from './resource_manager';\n\nimport
{FunctionExecutor} from './types';\n\ninterface NodeWithContexts {\n contexts: ExecutionContextInfo[];\n node:
Node;\n}\n\nexport class GraphExecutor implements FunctionExecutor {\n private compiledMap: Map<string,
Node[]> = new Map();\n private _weightMap: NamedTensorsMap = {};\n private _weightIds: number[];\n private
_signature: ISignatureDef;\n private _inputs: Node[];\n private _outputs: Node[];\n private _initNodes: Node[]; //
Internal init nodes to start initialization.\n private SEPERATOR = ',';\n private _functions: {[key: string]: Graph} =
{};\n private _functionExecutorMap: {[key: string]: FunctionExecutor} = {};\n private _resourceManager:
ResourceManager;\n\n get weightIds(): number[] {\n return this.parent ? this.parent.weightIds : this._weightIds;\n
}\n\n get functionExecutorMap(): {[key: string]: FunctionExecutor} {\n return this.parent ?
this.parent.functionExecutorMap :\n this._functionExecutorMap;\n }\n\n get weightMap():
NamedTensorsMap {\n return this.parent ? this.parent.weightMap : this._weightMap;\n }\n\n set
weightMap(weightMap: NamedTensorsMap) {\n const weightIds = Object.keys(weightMap).map(\n key =>
weightMap[key].map(tensor => tensor.id);\n this._weightIds = [].concat(...weightIds);\n this._weightMap =
weightMap;\n }\n\n /**\n * Set `ResourceManager` shared by executors of a model.\n * @param
resourceManager: `ResourceManager` of the `GraphModel`.\n */\n set resourceManager(resourceManager:
ResourceManager) {\n this._resourceManager = resourceManager;\n }\n\n get inputs(): TensorInfo[] {\n return
this._inputs.map(node => {\n return {\n name: node.name,\n shape: node.attrParams['shape'] ?\n
node.attrParams['shape'].value as number[] :\n undefined,\n dtype: node.attrParams['dtype'] ?\n
node.attrParams['dtype'].value as DataType :\n undefined\n }; \n });\n }\n\n get outputs(): TensorInfo[]
{\n return this._outputs.map(node => {\n return {\n name: node.name,\n shape:
node.attrParams['shape'] ?\n node.attrParams['shape'].value as number[] :\n undefined,\n dtype:
node.attrParams['dtype'] ?\n node.attrParams['dtype'].value as DataType :\n undefined\n }; \n });\n
}\n\n get inputNodes(): string[] {\n return this._inputs.map(node => node.signatureKey || node.name);\n }\n\n
get outputNodes(): string[] {\n return this._outputs.map((node) => {\n const name = node.signatureKey ||
node.name;\n return node.defaultOutput ? (`${name}:${node.defaultOutput}`) : name;\n });\n }\n\n get
functions(): {[key: string]: ISignatureDef} {\n return Object.keys(this._functions).reduce((map, key) => {\n
map[key] = this._functions[key].signature;\n return map;\n }, {} as {[key: string]: ISignatureDef});\n }\n\n
/**\n * @param graph Graph the model or function graph to be executed.\n * @param parent When building
function executor you need to set the parent\n * executor. Since the weights and function executor maps are set at
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parent\n * level, that function executor can access the function maps and weight maps\n * through the parent.\n
*\n constructor(private graph: Graph, private parent?: GraphExecutor) {\n this._outputs = graph.outputs;\n this._inputs = graph.inputs;\n this._initNodes = graph.initNodes;\n this._signature = graph.signature;\n this._functions = graph.functions;\n // create sub-graph executors\n if (graph.functions != null) {\n Object.keys(graph.functions).forEach(name => {\n this._functionExecutorMap[name] =\n new\n GraphExecutor(graph.functions[name], this);\n });\n }\n private getCompilationKey(inputs: Node[],\n outputs: Node[]): string {\n const sortedInputs = inputs.map(node => node.name).sort();\n const sortedOutputs =\n outputs.map(node => node.name).sort();\n return sortedInputs.join(this.SEPERATOR) + '--' +\n sortedOutputs.join(this.SEPERATOR);\n }\n /**\n * Compiles the inference graph and returns the minimal set\n of nodes that are\n * required for execution, in the correct execution order.\n */\n private compile(inputs:\n NamedTensorMap, outputs: Node[]): Node[] {\n const executionInfo =\n getExecutionSubgraph(inputs,\n outputs, this.weightMap, this._initNodes);\n const {missingInputs, dynamicNode, syncInputs} = executionInfo;\n if (dynamicNode != null) {\n throw new Error(\n `This execution contains the node\n '${dynamicNode.name}', which has\n `the dynamic op '${dynamicNode.op}'. Please use\n `+\n `model.executeAsync() instead. Alternatively, to avoid the\n `+\n `dynamic ops, specify the inputs\n [${syncInputs}]);\n }\n if (missingInputs.length > 0) {\n const outNames = outputs.map(n => n.name);\n const inNames = Object.keys(inputs);\n throw new Error(\n `Cannot compute the outputs [${outNames}]\n from the provided inputs\n `+\n `[${inNames}]. Missing the following inputs: [${missingInputs}]);\n }\n return getNodesInTopologicalOrder(\n this.graph, this.weightMap, executionInfo);\n }\n /**\n * Executes\n the inference for given input tensors.\n * @param inputs Tensor map for the model inputs, keyed by the input\n node\n * names.\n * @param outputs Optional. output node name from the Tensorflow model, if\n * no outputs\n are specified, the default outputs of the model would be used.\n * You can inspect intermediate nodes of the model\n by adding them to the\n * outputs array.\n */\n execute(inputs: NamedTensorMap, outputs?: string[]): Tensor[]\n {\n inputs = this.mapInputs(inputs);\n const names = Object.keys(inputs).sort();\n this.checkInputs(inputs);\n this.checkInputShapeAndType(inputs);\n outputs = this.mapOutputs(outputs);\n this.checkOutputs(outputs);\n const inputNodes =\n names.map(name => this.graph.nodes[parseNodeName(name)][0]);\n const\n outputNodeNames = outputs.map(name => parseNodeName(name)[0]);\n let outputNodes =\n outputNodeNames.map(name => this.graph.nodes[name]);\n // If no outputs are specified, then use the default\n outputs of the model.\n if (outputNodes.length === 0) {\n outputNodes = this._outputs;\n }\n const\n compilationKey = this.getCompilationKey(inputNodes, outputNodes);\n // Do nothing if the compiled graph\n cache contains the input.\n let orderedNodes = this.compiledMap.get(compilationKey);\n if (orderedNodes ==\n null) {\n orderedNodes = this.compile(inputs, outputNodes);\n this.compiledMap.set(compilationKey,\n orderedNodes);\n }\n const tensorArrayMap: TensorArrayMap = {};\n const tensorListMap: TensorListMap\n = {};\n return tidy(() => {\n const context = new ExecutionContext(\n this.weightMap,\n tensorArrayMap, tensorListMap,\n this.functionExecutorMap);\n const tensorsMap: NamedTensorsMap =\n {...this.weightMap};\n Object.keys(inputs).forEach(name => {\n const [nodeName, index] =\n parseNodeName(name);\n const tensors: Tensor[] = [];\n tensors[index] = inputs[name];\n tensorsMap[nodeName] = tensors;\n });\n const tensorsToKeep = this.getFrozenTensorIds(tensorsMap);\n const intermediateTensorConsumerCount: {[key: number]: number} = {};\n for (let i = 0; i <\n orderedNodes.length; i++) {\n const node = orderedNodes[i];\n if (!tensorsMap[node.name]) {\n const\n tensors =\n executeOp(node, tensorsMap, context, this._resourceManager) as\n Tensor[];\n if\n (util.isPromise(tensors)) {\n throw new Error(\n `The execution of the op\n '${node.op}' returned a\n promise.\n `+\n `Please use model.executeAsync() instead.`);\n }\n tensorsMap[node.name] =\n tensors;\n this.checkTensorForDisposal(\n node.name, node, tensorsMap, context, tensorsToKeep,\n outputNodeNames, intermediateTensorConsumerCount);\n }\n }\n // dispose the context for the root\n executor\n if (this.parent == null) {\n context.dispose(tensorsToKeep);\n }\n return outputs.map(name\n => getTensor(name, tensorsMap, context));\n });\n }\n private getFrozenTensorIds(tensorMap:\n NamedTensorsMap): Set<number> {\n const ids = [].concat.apply(\n [],\n Object.keys(tensorMap)\n }

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.map(key => tensorMap[key]))\n .map(tensors => tensors.map(tensor => tensor.id));\n return new
Set(ids);\n }\n private checkTensorForDisposal(\n nodeName: string, node: Node, tensorMap:
NamedTensorMap,\n context: ExecutionContext, tensorsToKeep: Set<number>,\n outputNames: string[],\n intermediateTensorConsumerCount: {[key: string]: number}) {\n // Skip output nodes and any control flow
nodes, since its dependency is\n // tricky to track correctly.\n if (node.category === 'control' ||
outputNames.indexOf(nodeName) !== -1) {\n return;\n }\n tensorMap[nodeName].forEach(tensor => {\n
if (tensor !== null) {\n intermediateTensorConsumerCount[tensor.id] =\n
(intermediateTensorConsumerCount[tensor.id] || 0) +\n node.children.length;\n }\n });\n
node.inputs.forEach(input => {\n // Skip any control flow nodes, since its dependency is tricky to track\n //
correctly.\n if (input.category !== 'control') {\n const tensors =\n
getTensorsForCurrentContenxt(input.name, tensorMap, context);\n if (tensors !== null) {\n
tensors.forEach(tensor => {\n if (tensor && !tensorsToKeep.has(tensor.id)) {\n const count =
intermediateTensorConsumerCount[tensor.id];\n if (count === 1) {\n tensor.dispose();\n
delete intermediateTensorConsumerCount[tensor.id];\n } else if (count !== null) {\n // only
intermediate nodes has count set, inputs and weights are\n // not.\n
intermediateTensorConsumerCount[tensor.id]--;\n }\n }\n });\n }\n });\n }\n\n
/**\n * Executes the inference for given input tensors in Async fashion.\n * @param inputs Tensor map for the
model inputs, keyed by the input node\n * names.\n * @param outputs output node name from the Tensorflow
model, if no outputs\n * are specified, the default outputs of the model would be used. You can\n * inspect
intermediate nodes of the model by adding them to the outputs\n * array.\n */\n async executeAsync(inputs:
NamedTensorMap, outputs?: string[]):\n Promise<Tensor[]> {\n return this._executeAsync(inputs, outputs);\n
}\n\n /**\n * Executes the inference for given input tensors in Async fashion.\n * @param inputs Tensor map for
the model inputs, keyed by the input node\n * names.\n * @param outputs Optional. output node name from the
Tensorflow model,\n * if no outputs are specified, the default outputs of the model would be\n * used. You can
inspect intermediate nodes of the model by adding them to the\n * outputs array.\n * @param
isFunctionExecution Optional. Flag for executing a function.\n * @param tensorArrayMap Optional, global
TensorArray map by id. Used for\n * function execution.\n * @param tensorListMap Optinal global TensorList
map by id. Used for\n * function execution.\n */\n private async _executeAsync(\n inputs: NamedTensorMap,
outputs?: string[], isFunctionExecution = false,\n tensorArrayMap: TensorArrayMap = {},\n tensorListMap:
TensorListMap = {}): Promise<Tensor[]> {\n if (!isFunctionExecution) {\n inputs = this.mapInputs(inputs);\n
this.checkInputs(inputs);\n this.checkInputShapeAndType(inputs);\n outputs = this.mapOutputs(outputs);\n
this.checkOutputs(outputs);\n }\n const context = new ExecutionContext(\n this.weightMap,\n
tensorArrayMap, tensorListMap,\n this.functionExecutorMap);\n // Graph with control flow op requires
runtime evaluation of the execution\n // order, while without control flow the execution order is pre-determined\n
// in the compile method.\n const tensorMap = await this.executeWithControlFlow(\n inputs, context, outputs,
isFunctionExecution);\n const results = outputs.map(name => getTensor(name, tensorMap, context));\n //
dispose all the intermediate tensors\n const outputIds = results.map(t => t.id);\n const inputIds =
Object.keys(inputs).map(name => inputs[name].id);\n const keepIds =\n new Set<number>([...outputIds,
...inputIds, ...this.weightIds]);\n Object.keys(tensorMap).forEach(key => {\n const tensorArray =
tensorMap[key];\n tensorArray.forEach(tensor => {\n if (tensor && !tensor.isDisposed &&
!keepIds.has(tensor.id)) {\n tensor.dispose();\n }\n });\n });\n // dispose the context for the root
executor\n if (this.parent == null) {\n context.dispose(keepIds);\n }\n return results;\n }\n\n
async executeFunctionAsync(\n inputs: Tensor[], tensorArrayMap: TensorArrayMap,\n tensorListMap:
TensorListMap): Promise<Tensor[]> {\n const mappedInputs = inputs.reduce((map, tensor, index) => {\n
map[this.inputs[index].name] = tensor;\n return map;\n }, {} as NamedTensorMap);\n return
this._executeAsync(\n mappedInputs, this.outputNodes, true, tensorArrayMap, tensorListMap);\n }\n\n
/**\n * When there are control flow nodes in the graph, the graph execution use\n * ExecutionContext to keep track of the
frames and loop iterators.\n * @param inputs placeholder tensors for the graph.\n * @param context the execution

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context object for current execution.\n * @param outputNames Optional. output node name from the Tensorflow
model,\n * if no outputs are specified, the default outputs of the model would be\n * used. You can inspect
intermediate nodes of the model by adding them to the\n * outputs array.\n * @param isFunctionExecution Flag
for executing a function.\n */\n private async executeWithControlFlow(\n inputs: NamedTensorMap, context:
ExecutionContext, outputNames?: string[],\n isFunctionExecution?: boolean): Promise<NamedTensorsMap> {\n
 const names = Object.keys(inputs);\n const inputNodes =\n names.map(name =>
this.graph.nodes[parseNodeName(name)[0]]);\n const outputNodeNames = outputNames.map(name =>
parseNodeName(name)[0]);\n let outputNodes = outputNodeNames.map(name => this.graph.nodes[name]);\n\n
// If no outputs are specified, then use the default outputs of the model.\n if (outputNodes.length === 0) {\n
outputNodes = this._outputs;\n }\n\n const {usedNodes, missingInputs, dynamicNode, syncInputs} =\n getExecutionSubgraph(\n inputs, outputNodes, this.weightMap, this._initNodes);\n\n // First nodes to
execute include inputNodes, weights, and initNodes.\n const stack: NodeWithContexts[] = [\n ...inputNodes,
...this.graph.weights, ...(this._initNodes || [])\n].map(node => {\n return {node, contexts:
context.currentContext};\n });\n const tensorsMap: NamedTensorsMap = {...this.weightMap};\n\n
Object.keys(inputs).forEach(name => {\n const [nodeName, index] = parseNodeName(name);\n const
tensors: Tensor[] = [];\n tensors[index] = inputs[name];\n tensorsMap[nodeName] = tensors;\n });\n const
intermediateTensorConsumerCount: {[key: number]: number} = {};\n const tensorsToKeep =
this.getFrozenTensorIds(tensorsMap);\n const added: {[key: string]: boolean} = {};\n while (stack.length > 0)
{\n const promises = this.processStack(\n inputNodes, stack, context, tensorsMap, added, tensorsToKeep,\n
 outputNodeNames, intermediateTensorConsumerCount, usedNodes);\n await Promise.all(promises);\n }\n\n
if (dynamicNode == null && !isFunctionExecution) {\n console.warn(\n `This model execution did not
contain any nodes with control flow ` +\n `or dynamic output shapes. You can use model.execute()
instead.`);\n }\n const missingOutputs =\n outputNodes\n .filter(\n node =>
!isControlFlow(node) &&\n !getTensor(node.name, tensorsMap, context))\n .map(node =>
node.name);\n if (missingOutputs.length > 0) {\n let alternativeMsg = ";\n if (dynamicNode != null) {\n
alternativeMsg =\n `Alternatively, to avoid the dynamic ops, use model.execute() ` +\n `and specify
the inputs [${syncInputs}]`;\n }\n throw new Error(\n `Cannot compute the outputs [${missingOutputs}]
from the provided ` +\n `inputs [${names}]. Consider providing the following inputs: ` +\n
`${missingInputs}. ${alternativeMsg}`);\n }\n return tensorsMap;\n}\n\n private processStack(\n
inputNodes: Node[], stack: NodeWithContexts[], context: ExecutionContext,\n tensorMap: NamedTensorsMap,
added: {[key: string]: boolean},\n tensorsToKeep: Set<number>, outputNames: string[],\n
intermediateTensorConsumerCount: {[key: number]: number},\n usedNodes: Set<string>) {\n const promises:
Array<Promise<Tensor[]>> = [];\n while (stack.length > 0) {\n const item = stack.pop();\n
context.currentContext = item.contexts;\n let nodeName = ";\n // The tensor of the Enter op with isConstant
set should be set\n // in the parent scope, so it will be available as constant for the\n // whole loop.\n if
(item.node.op === 'Enter' &&\n getParamValue('isConstant', item.node, tensorMap, context)) {\n
[nodeName] = getNodeNameAndIndex(item.node.name, context);\n }\n\n // only process nodes that are not in
the tensorMap yet, this include\n // inputNodes and internal initNodes.\n if (tensorMap[item.node.name] ==
null) {\n const tensors =\n executeOp(item.node, tensorMap, context, this._resourceManager);\n if
(!nodeName) {\n [nodeName] = getNodeNameAndIndex(item.node.name, context);\n }\n const
currentContext = context.currentContext;\n if (util.isPromise(tensors)) {\n promises.push((tensors as
Promise<Tensor[]>).then(t => {\n tensorMap[nodeName] = t;\n context.currentContext =
currentContext;\n this.checkTensorForDisposal(\n nodeName, item.node, tensorMap, context,
tensorsToKeep,\n outputNames, intermediateTensorConsumerCount);\n this.processChildNodes(\n
 item.node, stack, context, tensorMap, added, usedNodes);\n return t;\n }));\n } else {\n
tensorMap[nodeName] = tensors as Tensor[];\n this.checkTensorForDisposal(\n nodeName,
item.node, tensorMap, context, tensorsToKeep,\n outputNames, intermediateTensorConsumerCount);\n this.processChildNodes(\n
 item.node, stack, context, tensorMap, added, usedNodes);\n }\n } else {\n

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 this.processChildNodes(\n item.node, stack, context, tensorMap, added, usedNodes);\n }\n }\n
return promises;\n }\n\n private processChildNodes(\n node: Node, stack: NodeWithContexts[], context:
ExecutionContext,\n tensorMap: NamedTensorsMap, added: {[key: string]: boolean},\n usedNodes:
Set<string>) {\n node.children.forEach((childNode) => {\n const [nodeName,] =
getNodeNameAndIndex(childNode.name, context);\n if (added[nodeName] || !usedNodes.has(childNode.name))
{\n return;\n }\n // Merge op can be pushed if any of its inputs has value.\n if (childNode.op ===
'Merge') {\n if (childNode.inputNames.some(name => {\n return !!getTensor(name, tensorMap,
context);\n })) {\n added[nodeName] = true;\n stack.push({ contexts: context.currentContext,
node: childNode});\n }\n } else // Otherwise all inputs must to have value.\n if
(childNode.inputNames.every(name => {\n return !!getTensor(name, tensorMap, context);\n }))
{\n added[nodeName] = true;\n stack.push({ contexts: context.currentContext, node: childNode});\n }\n
});\n }\n\n /**\n * Releases the memory used by the weight tensors.\n */\n dispose() {\n
Object.keys(this.weightMap)\n .forEach(\n key => this.weightMap[key].forEach(tensor =>
tensor.dispose());\n }\n\n private checkInputShapeAndType(inputs: NamedTensorMap) {\n
Object.keys(inputs).forEach(name => {\n const input = inputs[name];\n const [nodeName,] =
parseNodeName(name);\n const node = this.graph.nodes[nodeName];\n if (node.attrParams['shape'] &&
node.attrParams['shape'].value) {\n const shape = node.attrParams['shape'].value as number[];\n const
match = shape.length === input.shape.length &&\n input.shape.every(\n (dim, index) =>
shape[index] === -1 || shape[index] === dim);\n util.assert(\n match,\n () => `The shape of
dict['${node.name}'] provided in ` +\n `model.execute(dict) must be [${shape}], but was ` +\n
`${input.shape}`);\n }\n if (node.attrParams['dtype'] && node.attrParams['dtype'].value) {\n
util.assert(\n input.dtype === node.attrParams['dtype'].value as string,\n () => `The dtype of
dict['${node.name}'] provided in ` +\n `model.execute(dict) must be ` +\n
`${node.attrParams['dtype'].value}, but was ${input.dtype}`);\n }\n });\n }\n\n private mapInputs(inputs:
NamedTensorMap) {\n const result: NamedTensorMap = {};\n for (const inputName in inputs) {\n if
(this._signature !== null && this._signature.inputs !== null &&\n this._signature.inputs[inputName] !== null) {\n
 const tensor = this._signature.inputs[inputName];\n result[tensor.name] = inputs[inputName];\n } else {\n
 result[inputName] = inputs[inputName];\n }\n }\n return result;\n }\n\n private checkInputs(inputs:
NamedTensorMap) {\n const notInGraph = Object.keys(inputs).filter(name => {\n const [nodeName] =
parseNodeName(name);\n return this.graph.nodes[nodeName] == null;\n });\n if (notInGraph.length > 0) {\n
throw new Error(\n `The dict provided in model.execute(dict) has ` +\n `keys: [${notInGraph}] that are
not part of graph`);\n }\n }\n\n private mapOutputs(outputs: string[]) {\n return outputs.map(name => {\n
if (this._signature !== null && this._signature.outputs !== null &&\n this._signature.outputs[name] !== null) {\n
const tensor = this._signature.outputs[name];\n return tensor.name;\n }\n return name;\n }, {});\n }\n\n
private checkOutputs(outputs: string[]): void {\n outputs.forEach(name => {\n const [normalizedName] =
parseNodeName(name);\n if (!this.graph.nodes[normalizedName]) {\n throw new Error(`The output
'${name}' is not found in the graph`);\n }\n });\n }\n }\n\n", /**\n * @license\n * Copyright 2020 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n
* http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */\n\n
=====}\n
*/\nimport {HashMap, NamedTensorMap} from './data/types';\nimport {HashTable} from
'/hash_table';\n\n/**\n * Contains global resources of a model.\n */\nexport class ResourceManager {\n
constructor(\n readonly hashTableNameToHandle: NamedTensorMap = {},\n readonly hashTableMap:
HashMap = {}) {\n\n /**\n * Register a `HashTable` in the resource manager.\n */\n * The `HashTable`

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can be retrieved by `resourceManager.getHashTableById`,\n * where id is the table handle tensor's id.\n *\n *
@param name Op node name that creates the `HashTable`.\n * @param hashTable The `HashTable` to be added to
resource manager.\n */\n addHashTable(name: string, hashTable: HashTable) {\n
this.hashTableNameToHandle[name] = hashTable.handle;\n this.hashTableMap[hashTable.id] = hashTable;\n
}\n\n /**\n * Get the table handle by node name.\n * @param name Op node name that creates the `HashTable`.\n
This name is also\n * used in the inputs list of lookup and import `HashTable` ops.\n */\n
getHashTableHandleByName(name: string) {\n return this.hashTableNameToHandle[name];\n }\n\n /**\n *
Get the actual `HashTable` by its handle tensor's id.\n * @param id The id of the handle tensor.\n */\n
getHashTableById(id: number): HashTable {\n return this.hashTableMap[id];\n }\n\n /**\n * Dispose
`ResourceManager`, including its hashTables and tensors in them.\n */\n dispose() {\n for (const key in
this.hashTableMap) {\n this.hashTableMap[key].clearAndClose();\n delete this.hashTableMap[key];\n }\n\n
for (const name in this.hashTableNameToHandle) {\n this.hashTableNameToHandle[name].dispose();\n
delete this.hashTableNameToHandle[name];\n }\n }\n\n"/**\n * @license\n * Copyright 2018 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {InferenceModel, io, ModelPredictConfig, NamedTensorMap, Tensor} from '@tensorflow/tfjs-
core';\n\nimport * as tensorflow from '../data/compiled_api';\n\nimport {NamedTensorsMap, TensorInfo} from
'../data/types';\n\nimport {OperationMapper} from '../operations/operation_mapper';\n\nimport {GraphExecutor} from
'./graph_executor';\n\nimport {ResourceManager} from './resource_manager';\n\n\nexport const
TFHUB_SEARCH_PARAM = '?tfjs-format=file';\n\nexport const DEFAULT_MODEL_NAME =
'model.json';\n\n/**\n * A `tf.GraphModel` is a directed, acyclic graph built from a\n * SavedModel GraphDef and
allows inference execution.\n *\n * A `tf.GraphModel` can only be created by loading from a model converted
from\n * a [TensorFlow SavedModel](https://www.tensorflow.org/guide/saved_model) using\n * the command line
converter tool and loaded via `tf.loadGraphModel`.\n *\n * @doc {heading: 'Models', subheading: 'Classes'}\n
*/\n\nexport class GraphModel implements InferenceModel {\n private executor: GraphExecutor;\n private version =
'n/a';\n private handler: io.IOHandler;\n private artifacts: io.ModelArtifacts;\n private initializer: GraphExecutor;\n
private resourceManager: ResourceManager;\n private signature: tensorflow.ISignatureDef;\n\n // Returns the
version information for the tensorflow model GraphDef.\n get modelVersion(): string {\n return this.version;\n
}\n\n get inputNodes(): string[] {\n return this.executor.inputNodes;\n }\n\n get outputNodes(): string[] {\n
return this.executor.outputNodes;\n }\n\n get inputs(): TensorInfo[] {\n return this.executor.inputs;\n }\n\n get
outputs(): TensorInfo[] {\n return this.executor.outputs;\n }\n\n get weights(): NamedTensorsMap {\n return
this.executor.weightMap;\n }\n\n get metadata(): {} {\n return this.artifacts.userDefinedMetadata;\n }\n\n get
modelSignature(): {} {\n return this.signature;\n }\n\n /**\n * @param modelUrl url for the model, or an
`io.IOHandler`.\n * @param weightManifestUrl url for the weight file generated by\n * scripts/convert.py
script.\n * @param requestOptions options for Request, which allows to send credentials\n * and custom
headers.\n * @param onProgress Optional, progress callback function, fired periodically\n * before the load is
completed.\n */\n constructor(\n private modelUrl: string|io.IOHandler,\n private loadOptions:
io.LoadOptions = {})\n {\n if (loadOptions == null) {\n this.loadOptions = {};\n }\n this.resourceManager =
new ResourceManager();\n }\n\n private findIOHandler() {\n const path = this.modelUrl;\n if ((path as
io.IOHandler).load != null) {\n // Path is an IO Handler.\n this.handler = path as io.IOHandler;\n } else if
(this.loadOptions.requestInit != null) {\n this.handler = io.browserHTTPRequest(path as string,\n
this.loadOptions);\n } else {\n const handlers = io.getLoadHandlers(path as string, this.loadOptions);\n if
(handlers.length === 0) {\n // For backward compatibility: if no load handler can be found,\n // assume it is

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a relative http path.\n handlers.push(io.browserHTTPRequest(path as string, this.loadOptions));\n } else if
(handlers.length > 1) {\n throw new Error(\n `Found more than one (${handlers.length}) load handlers
for ` +\n `URL '${[path]}'`);\n }\n this.handler = handlers[0];\n }\n}\n\n/**\n * Loads the model
and weight files, construct the in memory weight map and\n * compile the inference graph.\n */\n async load():
Promise<boolean> {\n this.findIOHandler();\n if (this.handler.load == null) {\n throw new Error(\n
'Cannot proceed with model loading because the IOHandler provided ' +\n 'does not have the `load` method
implemented.);\n }\n const artifacts = await this.handler.load();\n\n return this.loadSync(artifacts);\n}\n\n
/**\n * Synchronously construct the in memory weight map and\n * compile the inference graph. Also initialize
hashtable if any.\n */\n * @doc {heading: 'Models', subheading: 'Classes', ignoreCI: true}\n */\n
loadSync(artifacts: io.ModelArtifacts) {\n this.artifacts = artifacts;\n const graph = this.artifacts.modelTopology
as tensorflow.IGraphDef;\n\n let signature;\n if (this.artifacts.userDefinedMetadata != null &&\n
this.artifacts.userDefinedMetadata.signature != null) {\n signature = // tslint:disable-next-line:no-any\n
(this.artifacts.userDefinedMetadata as any).signature as\n tensorflow.ISignatureDef;\n } else {\n signature
= this.artifacts.signature;\n }\n this.signature = signature;\n\n this.version =
`${graph.versions.producer}.${graph.versions.minConsumer}`;\n const weightMap =\n
io.decodeWeights(this.artifacts.weightData, this.artifacts.weightSpecs);\n this.executor = new GraphExecutor(\n
 OperationMapper.Instance.transformGraph(graph, this.signature);\n this.executor.weightMap =
this.convertTensorMapToTensorsMap(weightMap);\n // Attach a model-level resourceManager to each executor
to share resources,\n // such as `HashTable`.\n this.executor.resourceManager = this.resourceManager;\n\n if
(artifacts.modelInitializer != null &&\n (artifacts.modelInitializer as tensorflow.IGraphDef).node != null) {\n
const initializer =\n OperationMapper.Instance.transformGraph(artifacts.modelInitializer);\n this.initializer
= new GraphExecutor(initializer);\n this.initializer.weightMap = this.executor.weightMap;\n // Attach a
model-level resourceManager to the initializer, the\n // hashTables created from when executing the initializer
will be stored\n // in the resourceManager.\n this.initializer.resourceManager = this.resourceManager;\n
this.initializer.executeAsync({}, []);\n }\n\n return true;\n}\n\n/**\n * Save the configuration and/or weights
of the GraphModel.\n */\n * An `IOHandler` is an object that has a `save` method of the proper\n * signature
defined. The `save` method manages the storing or\n * transmission of serialized data ("artifacts") that represent
the\n * model's topology and weights onto or via a specific medium, such as\n * file downloads, local storage,
IndexedDB in the web browser and HTTP\n * requests to a server. TensorFlow.js provides `IOHandler`\n *
implementations for a number of frequently used saving mediums, such as\n * `tf.io.browserDownloads` and
`tf.io.browserLocalStorage`. See `tf.io`\n * for more details.\n */\n * This method also allows you to refer to
certain types of `IOHandler`\n * as URL-like string shortcuts, such as 'localStorage://' and\n * 'indexeddb://'.\n
*\n * Example 1: Save `model`'s topology and weights to browser [local\n *
storage](https://developer.mozilla.org/en-US/docs/Web/API/Window/localStorage);\n * then load it back.\n *\n
* ```js\n * const modelUrl =\n * 'https://storage.googleapis.com/tfjs-
models/savedmodel/mobilenet_v2_1.0_224/model.json';\n * const model = await tf.loadGraphModel(modelUrl);\n
*\n * const zeros = tf.zeros([1, 224, 224, 3]);\n * model.predict(zeros).print();\n *\n * const saveResults = await
model.save('localStorage://my-model-1');\n *\n * const loadedModel = await
tf.loadGraphModel('localStorage://my-model-1');\n * console.log('Prediction from loaded model:');\n *
model.predict(zeros).print();\n * ```\n */\n * @param handlerOrURL An instance of `IOHandler` or a URL-
like,\n * scheme-based string shortcut for `IOHandler`.\n * @param config Options for saving the model.\n *
@returns A `Promise` of `SaveResult`, which summarizes the result of\n * the saving, such as byte sizes of the
saved artifacts for the model's\n * topology and weight values.\n */\n * @doc {heading: 'Models', subheading:
'Classes', ignoreCI: true}\n */\n async save(handlerOrURL: io.IOHandler|string, config?: io.SaveConfig):\n
Promise<io.SaveResult> {\n if (typeof handlerOrURL === 'string') {\n const handlers =
io.getSaveHandlers(handlerOrURL);\n if (handlers.length === 0) {\n throw new Error(\n `Cannot find
any save handlers for URL '${handlerOrURL}'`);\n } else if (handlers.length > 1) {\n throw new Error(\n
 `Found more than one (${handlers.length}) save handlers for ` +\n `URL '${handlerOrURL}'`);\n }\n

```

```

handlerOrURL = handlers[0];
 }
 if (handlerOrURL.save == null) {
 throw new Error(
'GraphModel.save() cannot proceed because the IOHandler ' +
 'provided does not have the `save` attribute
defined.');
```

return handlerOrURL.save(this.artifacts);

```

 }
 /**
 * Execute the inference for the input
tensors.
 * @param input The input tensors, when there is single input for the model,
 * inputs param
should be a `tf.Tensor`. For models with multiple inputs,
 * inputs params should be in either `tf.Tensor[]` if the
input order is
 * fixed, or otherwise NamedTensorMap format.
 * @param config Prediction configuration for specifying the batch size and
 * output node names. Currently the
batch size option is ignored for graph
 * model.
 * @returns Inference result tensors. The output would be
single `tf.Tensor`
 * if model has single output node, otherwise Tensor[] or NamedTensorMap[]
 * will be
returned for model with multiple outputs.
 * @doc {heading: 'Models', subheading: 'Classes'}
 */
predict(inputs: Tensor|Tensor[]|NamedTensorMap, config?: ModelPredictConfig):
Tensor|Tensor[]|NamedTensorMap {
 return this.execute(inputs, this.outputNodes);
}

private
normalizeInputs(inputs: Tensor|Tensor[]|
 NamedTensorMap): NamedTensorMap {
 if (!(inputs
instanceof Tensor) && !Array.isArray(inputs)) {
 // The input is already a NamedTensorMap.
 return
inputs;
 }
 inputs = Array.isArray(inputs) ? inputs : [inputs];
 if (inputs.length !== this.inputNodes.length) {
 throw new Error(
'Input tensor count mismatch,' +
 `the graph model has
${this.inputNodes.length} placeholders, ` +
 `while there are ${inputs.length} input tensors.');
```

return this.inputNodes.reduce((map, inputName, i) => {
 map[inputName] = (inputs as Tensor[])[i];
 return
map;
}, {} as NamedTensorMap);

```

}

private normalizeOutputs(outputs: string|string[]): string[] {
 outputs = outputs || this.outputNodes;
 return !Array.isArray(outputs) ? [outputs] : outputs;
}

/**
 * Executes inference for the model for given input tensors.
 * @param inputs tensor, tensor array or tensor map of
the inputs for the
 * model, keyed by the input node names.
 * @param outputs output node name from the
Tensorflow model, if no
 * outputs are specified, the default outputs of the model would be used.
 * You can
inspect intermediate nodes of the model by adding them to the
 * outputs array.
 * @returns A single
tensor if provided with a single output or no outputs
 * are provided and there is only one default output,
otherwise return a
 * tensor array. The order of the tensor array is the same as the outputs
 * if provided,
otherwise the order of outputNodes attribute of the model.
 * @doc {heading: 'Models', subheading:
'Classes'}
 */
execute(inputs: Tensor|Tensor[]|NamedTensorMap, outputs?: string|string[]):
Tensor|Tensor[] {
 inputs = this.normalizeInputs(inputs);
 outputs = this.normalizeOutputs(outputs);
 const
result = this.executor.execute(inputs, outputs);
 return result.length > 1 ? result : result[0];
}

/**
 * Executes inference for the model for given input tensors in async
 * fashion, use this method when your model
contains control flow ops.
 * @param inputs tensor, tensor array or tensor map of the inputs for the
 * model,
keyed by the input node names.
 * @param outputs output node name from the Tensorflow model, if no outputs
 * are specified, the default outputs of the model would be used. You can
 * inspect intermediate nodes of the
model by adding them to the outputs
 * array.
 * @returns A Promise of single tensor if provided with a
single output or
 * no outputs are provided and there is only one default output, otherwise
 * return a tensor
map.
 * @doc {heading: 'Models', subheading: 'Classes'}
 */
async executeAsync(
 inputs:
Tensor|Tensor[]|NamedTensorMap,
 outputs?: string|string[]): Promise<Tensor|Tensor[]> {
 inputs =
this.normalizeInputs(inputs);
 outputs = this.normalizeOutputs(outputs);
 const result = await
```

```

this.executor.executeAsync(inputs, outputs);\n return result.length > 1 ? result : result[0];\n }\n\n private
convertTensorMapToTensorsMap(map: NamedTensorMap): NamedTensorsMap {\n return
Object.keys(map).reduce((newMap: NamedTensorsMap, key) => {\n newMap[key] = [map[key]];\n return
newMap;\n }, {});\n }\n\n /**\n * Releases the memory used by the weight tensors and resourceManager.\n
*\n * @doc {heading: 'Models', subheading: 'Classes'}\n */\n dispose() {\n this.executor.dispose();\n\n if
(this.initializer) {\n this.initializer.dispose();\n }\n\n this.resourceManager.dispose();\n }\n}\n\n/**\n * Load
a graph model given a URL to the model definition.\n */\n * Example of loading MobileNetV2 from a URL and
making a prediction with a\n */\n * zeros input:\n */\n * ```js\n * const modelUrl =\n *
'https://storage.googleapis.com/tfjs-models/savedmodel/mobilenet_v2_1.0_224/model.json';\n * const model = await
tf.loadGraphModel(modelUrl);\n * const zeros = tf.zeros([1, 224, 224, 3]);\n * model.predict(zeros).print();\n * ```\n
*\n * Example of loading MobileNetV2 from a TF Hub URL and making a prediction with\n * a zeros input:\n */\n *
```js\n  * const modelUrl =\n  * 'https://tfhub.dev/google/imagenet/mobilenet_v2_140_224/classification/2';\n  *
const model = await tf.loadGraphModel(modelUrl, {fromTFHub: true});\n  * const zeros = tf.zeros([1, 224, 224,
3]);\n  * model.predict(zeros).print();\n  * ```\n  * @param modelUrl The url or an `io.IOHandler` that loads the
model.\n  * @param options Options for the HTTP request, which allows to send credentials\n  * and custom
headers.\n  */\n  * @doc {heading: 'Models', subheading: 'Loading'}\n  */\n  * export async function loadGraphModel(\n
modelUrl: string|io.IOHandler,\n  options: io.LoadOptions = {}): Promise<GraphModel> {\n  if (modelUrl ==
null) {\n    throw new Error(\n      'modelUrl in loadGraphModel() cannot be null. Please provide a url ' +\n      'or
an IOHandler that loads the model');\n  }\n  if (options == null) {\n    options = {};\n  }\n\n  if (options.fromTFHub)
{\n    if ((modelUrl as io.IOHandler).load == null) {\n      if (!(modelUrl as string).endsWith('/')) {\n        modelUrl =
(modelUrl as string) + '/';\n      }\n      modelUrl =
`${modelUrl}${DEFAULT_MODEL_NAME}${TFHUB_SEARCH_PARAM}`;\n    }\n  }\n\n  const model = new
GraphModel(modelUrl, options);\n  await model.load();\n  return
model;\n }\n\n",null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,"**\n  * dat-gui
JavaScript Controller Library\n  * http://code.google.com/p/dat-gui\n  */\n  * Copyright 2011 Data Arts Team, Google
Creative Lab\n  */\n  * Licensed under the Apache License, Version 2.0 (the "License");\n  * you may not use this file
except in compliance with the License.\n  * You may obtain a copy of the License at\n  */\n  *
http://www.apache.org/licenses/LICENSE-2.0\n  */\n\nimport Color from './color/Color';\nimport math from
'./color/math';\nimport interpret from './color/interpret';\nimport Controller from './controllers/Controller';\nimport
BooleanController from './controllers/BooleanController';\nimport OptionController from
'./controllers/OptionController';\nimport StringController from './controllers/StringController';\nimport
NumberController from './controllers/NumberController';\nimport NumberControllerBox from
'./controllers/NumberControllerBox';\nimport NumberControllerSlider from
'./controllers/NumberControllerSlider';\nimport FunctionController from './controllers/FunctionController';\nimport
ColorController from './controllers/ColorController';\nimport domImport from './dom/dom';\nimport GUIImport
from './gui/GUI';\n\nexport const color = {\n  Color: Color,\n  math: math,\n  interpret: interpret\n};\n\nexport const
controllers = {\n  Controller: Controller,\n  BooleanController: BooleanController,\n  OptionController:
OptionController,\n  StringController: StringController,\n  NumberController: NumberController,\n
NumberControllerBox: NumberControllerBox,\n  NumberControllerSlider: NumberControllerSlider,\n
FunctionController: FunctionController,\n  ColorController: ColorController\n};\n\nexport const dom = { dom:
domImport };\n\nexport const gui = { GUI: GUIImport };\n\nexport const GUI = GUIImport;\n\nexport default {\n
color,\n  controllers,\n  dom,\n  gui,\n  GUI\n};\n\n",**\n  * dat-gui JavaScript Controller Library\n  *
http://code.google.com/p/dat-gui\n  */\n  * Copyright 2011 Data Arts Team, Google Creative Lab\n  */\n  * Licensed
under the Apache License, Version 2.0 (the "License");\n  * you may not use this file except in compliance with the
License.\n  * You may obtain a copy of the License at\n  */\n  * http://www.apache.org/licenses/LICENSE-2.0\n
*/\n\nexport default function(color, forceCSSHex) {\n  const colorFormat =
color.__state.conversionName.toString();\n\n  const r = Math.round(color.r);\n  const g = Math.round(color.g);\n
const b = Math.round(color.b);\n  const a = color.a;\n  const h = Math.round(color.h);\n  const s =

```

```

color.s.toFixed(1);\n const v = color.v.toFixed(1);\n\n if (forceCSSHex || (colorFormat ===
'THREE_CHAR_HEX') || (colorFormat === 'SIX_CHAR_HEX')) {\n let str = color.hex.toString(16);\n while
(str.length < 6) {\n str = '0' + str;\n }\n return '#' + str;\n } else if (colorFormat === 'CSS_RGB') {\n return
'rgb(' + r + ',' + g + ',' + b + ')';\n } else if (colorFormat === 'CSS_RGBA') {\n return 'rgba(' + r + ',' + g + ',' + b +
',' + a + ')';\n } else if (colorFormat === 'HEX') {\n return '0x' + color.hex.toString(16);\n } else if (colorFormat
=== 'RGB_ARRAY') {\n return '[' + r + ',' + g + ',' + b + ']';\n } else if (colorFormat === 'RGBA_ARRAY') {\n
return '[' + r + ',' + g + ',' + b + ',' + a + ']';\n } else if (colorFormat === 'RGB_OBJ') {\n return '{r:' + r + ',g:' + g +
',b:' + b + '}';\n } else if (colorFormat === 'RGBA_OBJ') {\n return '{r:' + r + ',g:' + g + ',b:' + b + ',a:' + a + '}';\n
} else if (colorFormat === 'HSV_OBJ') {\n return '{h:' + h + ',s:' + s + ',v:' + v + '}';\n } else if (colorFormat ===
'HSVA_OBJ') {\n return '{h:' + h + ',s:' + s + ',v:' + v + ',a:' + a + '}';\n }\n\n return 'unknown
format';\n}\n\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright
2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nconst ARR_EACH =
Array.prototype.forEach;\nconst ARR_SLICE = Array.prototype.slice;\n\n/*\n * Band-aid methods for things that
should be a lot easier in JavaScript.\n * Implementation and structure inspired by underscore.js\n *
http://documentcloud.github.com/underscore/\n *\n\nconst Common = {\n BREAK: {},\n\n extend:
function(target) {\n this.each(ARR_SLICE.call(arguments, 1), function(obj) {\n const keys = this.isObject(obj)
? Object.keys(obj) : [];\n keys.forEach(function(key) {\n if (!this.isUndefined(obj[key])) {\n
target[key] = obj[key];\n }\n }).bind(this);\n }, this);\n\n return target;\n },\n\n defaults: function(target)
{\n this.each(ARR_SLICE.call(arguments, 1), function(obj) {\n const keys = this.isObject(obj) ?
Object.keys(obj) : [];\n keys.forEach(function(key) {\n if (this.isUndefined(target[key])) {\n target[key]
= obj[key];\n }\n }).bind(this);\n }, this);\n\n return target;\n },\n\n compose: function() {\n const
toCall = ARR_SLICE.call(arguments);\n return function() {\n let args = ARR_SLICE.call(arguments);\n for
(let i = toCall.length - 1; i >= 0; i--) {\n args = [toCall[i].apply(this, args)];\n }\n return args[0];\n
};\n },\n\n each: function(obj, itr, scope) {\n if (!obj) {\n return;\n }\n\n if (ARR_EACH && obj.forEach &&
obj.forEach === ARR_EACH) {\n obj.forEach(itr, scope);\n } else if (obj.length === obj.length + 0) { // Is
number but not NaN\n let key;\n let l;\n for (key = 0, l = obj.length; key < l; key++) {\n if (key in obj
&& itr.call(scope, obj[key], key) === this.BREAK) {\n return;\n }\n }\n } else {\n for (const key
in obj) {\n if (itr.call(scope, obj[key], key) === this.BREAK) {\n return;\n }\n }\n }\n },\n\n defer: function(fnc) {\n
setTimeout(fnc, 0);\n },\n\n // if the function is called repeatedly, wait until threshold
passes until we execute the function\n debounce: function(func, threshold, callImmediately) {\n let timeout;\n
return function() {\n const obj = this;\n const args = arguments;\n function delayed() {\n timeout =
null;\n if (!callImmediately) func.apply(obj, args);\n }\n\n const callNow = callImmediately ||
!timeout;\n\n clearTimeout(timeout);\n timeout = setTimeout(delayed, threshold);\n\n if (callNow) {\n
func.apply(obj, args);\n }\n },\n\n toArray: function(obj) {\n if (obj.toArray) return obj.toArray();\n
return ARR_SLICE.call(obj);\n },\n\n isUndefined: function(obj) {\n return obj === undefined;\n },\n\n isNull:
function(obj) {\n return obj === null;\n },\n\n isNaN: function(obj) {\n return isNaN(obj);\n },\n\n isArray:
Array.isArray || function(obj) {\n return obj.constructor === Array;\n },\n\n isObject: function(obj) {\n return
obj === Object(obj);\n },\n\n isNumber: function(obj) {\n return obj === obj + 0;\n },\n\n isString:
function(obj) {\n return obj === obj + '';\n },\n\n isBoolean: function(obj) {\n return obj === false || obj ===
true;\n },\n\n isFunction: function(obj) {\n return Object.prototype.toString.call(obj) === '[object Function]';\n
}\n\n};\n\nexport default Common;\n", "/*\n * dat-gui JavaScript Controller Library\n *
http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
*\n\nimport toString from './toString';\nimport common from './utils/common';\n\nconst INTERPRETATIONS =
[\n // Strings\n {\n litmus: common.isString,\n conversions: {\n THREE_CHAR_HEX: {\n read:

```

```

function(original) {\n      const test = original.match(/^#[A-F0-9]{6}$/i);\n      if (test ===\nnull) {\n      return false;\n    }\n    return {\n      space: 'HEX',\n      hex: parseInt(\n      '0x'\n      +\n      test[1].toString() + test[1].toString() +\n      test[2].toString() + test[2].toString() +\n      test[3].toString() + test[3].toString(), 0)\n    };\n  },\n  write: toString\n  },\n  SIX_CHAR_HEX:\n  {\n    read: function(original) {\n      const test = original.match(/^#[A-F0-9]{6}$/i);\n      if (test === null)\n      {\n      return false;\n      }\n      return {\n        space: 'HEX',\n        hex: parseInt('0x' +\ntest[1].toString(), 0)\n      };\n    },\n    write: toString\n  },\n  CSS_RGB: {\n    read:\nfunction(original) {\n      const test = original.match(/^rgb\\(\\s*(.+)\\s*,\\s*(.+)\\s*,\\s*(.+)\\s*\\)/);\n      if (test\n=== null) {\n      return false;\n    }\n    return {\n      space: 'RGB',\n      r: parseFloat(test[1]),\n      g: parseFloat(test[2]),\n      b: parseFloat(test[3])\n    };\n  },\n  write: toString\n  },\n  CSS_RGBA: {\n    read: function(original) {\n      const test =\noriginal.match(/^rgba\\(\\s*(.+)\\s*,\\s*(.+)\\s*,\\s*(.+)\\s*,\\s*(.+)\\s*\\)/);\n      if (test === null) {\n      return\nfalse;\n    }\n    return {\n      space: 'RGB',\n      r: parseFloat(test[1]),\n      g:\nparseFloat(test[2]),\n      b: parseFloat(test[3]),\n      a: parseFloat(test[4])\n    };\n  },\n  write:\ntoString\n  },\n  // Numbers\n  litmus: common.isNumber,\n  conversions: {\n    HEX: {\n      read: function(original) {\n      return {\n        space: 'HEX',\n        hex: original,\nconversionName: 'HEX'\n      };\n    },\n    write: function(color) {\n      return color.hex;\n    }\n  },\n  // Arrays\n  litmus: common.isArray,\n  conversions: {\n    RGB_ARRAY: {\n      read: function(original) {\n      if (original.length !== 3) {\n      return false;\n      }\n      return {\n        space: 'RGB',\n        r: original[0],\n        g: original[1],\n        b: original[2]\n      };\n    },\n    write:\nfunction(color) {\n      return [color.r, color.g, color.b];\n    }\n  },\n  RGBA_ARRAY: {\n    read:\nfunction(original) {\n      if (original.length !== 4) return false;\n      return {\n        space: 'RGB',\n        r:\noriginal[0],\n        g: original[1],\n        b: original[2],\n        a: original[3]\n      };\n    },\n    write:\nfunction(color) {\n      return [color.r, color.g, color.b, color.a];\n    }\n  },\n  // Objects\n  litmus: common.isObject,\n  conversions: {\n    RGBA_OBJ: {\n      read: function(original) {\n      if\n(common.isNumber(original.r) &&\n      common.isNumber(original.g) &&\n      common.isNumber(original.b) &&\n      common.isNumber(original.a)) {\n      return {\n        space:\n'RGB',\n        r: original.r,\n        g: original.g,\n        b: original.b,\n        a: original.a\n      };\n    }\n    return false;\n  },\n  write: function(color) {\n      return {\n        r: color.r,\n        g:\ncolor.g,\n        b: color.b,\n        a: color.a\n      };\n    }\n  },\n  RGB_OBJ: {\n    read:\nfunction(original) {\n      if (common.isNumber(original.r) &&\n      common.isNumber(original.g) &&\n      common.isNumber(original.b)) {\n      return {\n        space: 'RGB',\n        r: original.r,\n        g:\noriginal.g,\n        b: original.b\n      };\n    }\n    return false;\n  },\n  write: function(color)\n{\n      return {\n        r: color.r,\n        g: color.g,\n        b: color.b\n      };\n    }\n  },\n  HSVA_OBJ: {\n    read: function(original) {\n      if (common.isNumber(original.h) &&\n      common.isNumber(original.s) &&\n      common.isNumber(original.v) &&\n      common.isNumber(original.a)) {\n      return {\n        space: 'HSV',\n        h: original.h,\n        s:\noriginal.s,\n        v: original.v,\n        a: original.a\n      };\n    }\n    return false;\n  },\n  write: function(color) {\n      return {\n        h: color.h,\n        s: color.s,\n        v: color.v,\n        a:\ncolor.a\n      };\n    }\n  },\n  HSV_OBJ: {\n    read: function(original) {\n      if\n(common.isNumber(original.h) &&\n      common.isNumber(original.s) &&\n      common.isNumber(original.v)) {\n      return {\n        space: 'HSV',\n        h: original.h,\n        s:\noriginal.s,\n        v: original.v\n      };\n    }\n    return false;\n  },\n  write: function(color) {\n      return {\n        h: color.h,\n        s: color.s,\n        v: color.v\n      };\n    }\n  },\n  };\n  let\nresult;\nlet toReturn;\nconst interpret = function() {\n  toReturn = false;\n  const original = arguments.length > 1\n? common.toArray(arguments) : arguments[0];\n  common.each(INTERPRETATIONS, function(family) {\n    if\n(family.litmus(original)) {\n      common.each(family.conversions, function(conversion, conversionName) {\n        result = conversion.read(original);\n        if (toReturn === false && result !== false) {\n          toReturn = result;\n}

```



```

    result.conversionName = conversionName;\n        result.conversion = conversion;\n        return
common.BREAK;\n    }\n    });\n\n    return common.BREAK;\n    }\n});\n\nreturn toReturn;\n};\n\n\nexport
default interpret;\n\n", /**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n *
Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n *\n * you may not use this file except in compliance with the License.\n *\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n */\n\nlet tmpComponent;\n\nconst ColorMath =
{\n  hsv_to_rgb: function(h, s, v) {\n    const hi = Math.floor(h / 60) % 6;\n\n    const f = h / 60 - Math.floor(h /
60);\n\n    const p = v * (1.0 - s);\n\n    const q = v * (1.0 - (f * s));\n\n    const t = v * (1.0 - ((1.0 - f) * s));\n\n    const c =
[\n      [v, t, p],\n      [q, v, p],\n      [p, v, t],\n      [p, q, v],\n      [t, p, v],\n      [v, p, q]\n    ][hi];\n\n    return {\n      r:
c[0] * 255,\n      g: c[1] * 255,\n      b: c[2] * 255\n    };\n  },\n  rgb_to_hsv: function(r, g, b) {\n    const min =
Math.min(r, g, b);\n\n    const max = Math.max(r, g, b);\n\n    const delta = max - min;\n\n    let h;\n\n    let s;\n\n    if (max
!=== 0) {\n      s = delta / max;\n    } else {\n      return {\n        h: NaN,\n        s: 0,\n        v: 0\n      };\n    }\n\n    if (r
=== max) {\n      h = (g - b) / delta;\n    } else if (g === max) {\n      h = 2 + (b - r) / delta;\n    } else {\n      h = 4 + (r
- g) / delta;\n    }\n\n    h /= 6;\n\n    if (h < 0) {\n      h += 1;\n    }\n\n    return {\n      h: h * 360,\n      s: s,\n      v: max /
255\n    };\n  },\n  rgb_to_hex: function(r, g, b) {\n    let hex = this.hex_with_component(0, 2, r);\n\n    hex =
this.hex_with_component(hex, 1, g);\n\n    hex = this.hex_with_component(hex, 0, b);\n\n    return hex;\n  },\n  component_from_hex:
function(hex, componentIndex) {\n    return (hex >> (componentIndex * 8)) & 0xFF;\n  },\n  hex_with_component:
function(hex, componentIndex, value) {\n    return value << (tmpComponent =
componentIndex * 8) | (hex & ~(0xFF << tmpComponent));\n  };\n};\n\n\nexport default ColorMath;\n\n", /**\n * dat-
gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team,
Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *\n * you may not use
this file except in compliance with the License.\n *\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n */\n\nimport interpret from './interpret';\nimport math from
'./math';\nimport colorToString from './toString';\nimport common from './utils/common';\n\n\nclass Color {\n
  constructor() {\n    this.__state = interpret.apply(this, arguments);\n\n    if (this.__state === false) {\n      throw new
Error('Failed to interpret color arguments');\n    }\n\n    this.__state.a = this.__state.a || 1;\n  }\n\n  toString() {\n
return colorToString(this);\n  }\n\n  toHexString() {\n    return colorToString(this, true);\n  }\n\n  toOriginal() {\n
return this.__state.conversion.write(this);\n  }\n\n  \nfunction defineRGBComponent(target, component,
componentHexIndex) {\n    Object.defineProperty(target, component, {\n      get: function() {\n        if
(this.__state.space === 'RGB') {\n          return this.__state[component];\n        }\n\n        Color.recalculateRGB(this,
component, componentHexIndex);\n\n        return this.__state[component];\n      },\n      set: function(v) {\n        if
(this.__state.space !== 'RGB') {\n          Color.recalculateRGB(this, component, componentHexIndex);\n\n          this.__state.space =
'RGB';\n        }\n\n        this.__state[component] = v;\n      }\n    });\n  }\n\n  \nfunction
defineHSVComponent(target, component) {\n    Object.defineProperty(target, component, {\n      get: function() {\n
if (this.__state.space === 'HSV') {\n          return this.__state[component];\n        }\n\n        Color.recalculateHSV(this);\n\n        return
this.__state[component];\n      },\n      set: function(v) {\n        if
(this.__state.space !== 'HSV') {\n          Color.recalculateHSV(this);\n\n          this.__state.space = 'HSV';\n        }\n\n        this.__state[component] = v;\n      }\n    });\n  }\n\n  \nColor.recalculateRGB = function(color, component,
componentHexIndex) {\n    if (color.__state.space === 'HEX') {\n      color.__state[component] =
math.component_from_hex(color.__state.hex, componentHexIndex);\n    } else if (color.__state.space === 'HSV') {\n      \ncommon.extend(color.__state, math.hsv_to_rgb(color.__state.h, color.__state.s, color.__state.v));\n    } else {\n      throw new
Error('Corrupted color state');\n    }\n  };\n\n  \nColor.recalculateHSV = function(color) {\n    const result =
math.rgb_to_hsv(color.r, color.g, color.b);\n\n    common.extend(color.__state,\n      {\n        s: result.s,\n        v: result.v\n      }\n    );\n\n    if (!common.isNaN(result.h)) {\n      color.__state.h = result.h;\n    } else if
(common.isUndefined(color.__state.h)) {\n      color.__state.h = 0;\n    }\n  };\n\n  \nColor.COMPONENTS = ['r', 'g', 'b', 'h',
's', 'v', 'hex', 'a'];\n\n  \ndefineRGBComponent(Color.prototype, 'r', 2);\n\n  \ndefineRGBComponent(Color.prototype, 'g',
1);\n\n  \ndefineRGBComponent(Color.prototype, 'b', 0);\n\n  \ndefineHSVComponent(Color.prototype,
'h');\n\n  \ndefineHSVComponent(Color.prototype, 's');\n\n  \ndefineHSVComponent(Color.prototype,

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'v');\n\nObject.defineProperty(Color.prototype, 'a', {\n  get: function() {\n    return this.__state.a;\n  },\n  set:
function(v) {\n    this.__state.a = v;\n  }\n});\n\nObject.defineProperty(Color.prototype, 'hex', {\n  get: function() {\n
if (!this.__state.space !== 'HEX') {\n    this.__state.hex = math.rgb_to_hex(this.r, this.g, this.b);\n  }\n  return
this.__state.hex;\n  },\n  set: function(v) {\n    this.__state.space = 'HEX';\n    this.__state.hex = v;\n
  }\n});\n\nexport default Color;\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-
gui\n * \n * Copyright 2011 Data Arts Team, Google Creative Lab\n * \n * Licensed under the Apache License,
Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may
obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * \n * @class An
\"abstract\" class that represents a given property of an object.\n * \n * @param {Object} object The object to be
manipulated\n * @param {string} property The name of the property to be manipulated\n * \n * \n * class Controller {\n
  constructor(object, property) {\n    this.initialValue = object[property];\n\n    /*\n     * Those who extend this class
will put their DOM elements in here.\n     * @type {DOMElement}\n     * \n     * this.domElement =
document.createElement('div');\n\n     * \n     * The object to manipulate\n     * @type {Object}\n     * \n
     * this.object = object;\n\n     * \n     * The name of the property to manipulate\n     * @type {String}\n     * \n
     * this.property = property;\n\n     * \n     * The function to be called on change.\n     * @type {Function}\n     *
     * @ignore\n     * \n     * this.__onChange = undefined;\n\n     * \n     * The function to be called on finishing change.\n
     * @type {Function}\n     * @ignore\n     * \n     * this.__onFinishChange = undefined;\n  }\n\n  /*\n   * Specify that a
function fire every time someone changes the value with\n   * this Controller.\n   * \n   * @param {Function} fnc
This function will be called whenever the value\n   * is modified via this Controller.\n   * @returns {Controller}
this\n   * \n   * onChange(fnc) {\n     this.__onChange = fnc;\n     return this;\n   }\n\n   /*\n    * Specify that a function
fire every time someone \"finishes\" changing\n    * the value with this Controller. Useful for values that change\n    *
incrementally like numbers or strings.\n    * \n    * @param {Function} fnc This function will be called whenever\n    *
someone \"finishes\" changing the value via this Controller.\n    * @returns {Controller} this\n    * \n
    * onFinishChange(fnc) {\n     this.__onFinishChange = fnc;\n     return this;\n   }\n\n   /*\n    * Change the value of
<code>object[property]</code>\n    * \n    * @param {Object} newValue The new value of
<code>object[property]</code>\n    * \n    * setValue(newValue) {\n     this.object[this.property] = newValue;\n     if
(this.__onChange) {\n       this.__onChange.call(this, newValue);\n     }\n\n     this.updateDisplay();\n     return this;\n
  }\n\n   /*\n    * Gets the value of <code>object[property]</code>\n    * \n    * @returns {Object} The current value of
<code>object[property]</code>\n    * \n    * getValue() {\n     return this.object[this.property];\n   }\n\n   /*\n    *
Refreshes the visual display of a Controller in order to keep sync\n    * with the object's current value.\n    * @returns
{Controller} this\n    * \n    * updateDisplay() {\n     return this;\n   }\n\n   /*\n    * @returns {Boolean} true if the value
has deviated from initialValue\n    * \n    * isModified() {\n     return this.initialValue !== this.getValue();\n   }\n
}\n\nexport default Controller;\n", "/*\n * dat-gui JavaScript Controller Library\n *
http://code.google.com/p/dat-gui\n * \n * Copyright 2011 Data Arts Team, Google Creative Lab\n * \n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * \n
import common from '../utils/common';\n\nconst EVENT_MAP = {\n  HTMLEvents: ['change'],\n  MouseEvents: ['click', 'mousemove', 'mousedown', 'mouseup', 'mouseover'],\n  KeyboardEvents:
['keydown']\n};\n\nconst EVENT_MAP_INV = {};\n\ncommon.each(EVENT_MAP, function(v, k) {\n  common.each(v, function(e) {\n    EVENT_MAP_INV[e] = k;\n  });\n});\n\nconst CSS_VALUE_PIXELS =
/((\\d+(\\.\\d+)?)px/;\n\nfunction cssValueToPixels(val) {\n  if (val === '0' || common.isUndefined(val)) {\n    return
0;\n  }\n\n  const match = val.match(CSS_VALUE_PIXELS);\n\n  if (!common.isNull(match)) {\n    return
parseFloat(match[1]);\n  }\n\n  // TODO ...ems? %?\n\n  return 0;\n}\n\n/*\n * @namespace\n * @member
dat.dom\n * \n * \n * @param elem\n * @param selectable\n * \n * makeSelectable:
function(elem, selectable) {\n  if (elem === undefined || elem.style === undefined) return;\n\n  elem.onselectstart
= selectable ? function() {\n    return false;\n  } : function() {\n  }; \n\n  elem.style.MozUserSelect = selectable ?
'auto' : 'none';\n  elem.style.KhtmlUserSelect = selectable ? 'auto' : 'none';\n  elem.unselectable = selectable ? 'on' :
'off';\n  },\n\n  /*\n   * \n   * @param elem\n   * @param horizontal\n   * @param vert\n   * \n   * makeFullscreen:

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function(elem, hor, vert) {\n  let vertical = vert;\n  let horizontal = hor;\n\n  if (common.isUndefined(horizontal))\n  {\n    horizontal = true;\n  }\n\n  if (common.isUndefined(vertical)) {\n    vertical = true;\n  }\n\n  elem.style.position = 'absolute';\n\n  if (horizontal) {\n    elem.style.left = 0;\n    elem.style.right = 0;\n  }\n\n  if (vertical) {\n    elem.style.top = 0;\n    elem.style.bottom = 0;\n  }\n\n  /**\n   * @param elem\n   * @param eventType\n   * @param params\n   */\n  fakeEvent: function(elem, eventType, pars, aux) {\n    const\n    params = pars || {};\n    const className = EVENT_MAP_INV[eventType];\n    if (!className) {\n      throw new\n      Error('Event type ' + eventType + ' not supported.);\n    }\n    const evt = document.createEvent(className);\n    switch (className) {\n      case 'MouseEvents':\n        {\n          const clientX = params.x || params.clientX || 0;\n          const clientY = params.y || params.clientY || 0;\n          evt.initMouseEvent(eventType, params.bubbles || false,\n          params.cancelable || true, window, params.clickCount || 1,\n          0, // screen X\n          0, // screen Y\n          clientX, // client X\n          clientY, // client Y\n          false, false, false, false, 0, null);\n          break;\n        }\n      case 'KeyboardEvents':\n        {\n          const init = evt.initKeyboardEvent || evt.initKeyEvent; // webkit || moz\n          common.defaults(params, {\n            cancelable: true,\n            ctrlKey: false,\n            altKey: false,\n            shiftKey: false,\n            metaKey: false,\n            keyCode: undefined,\n            charCode: undefined\n          });\n          init(eventType, params.bubbles || false,\n          params.cancelable, window,\n          params.ctrlKey,\n          params.altKey,\n          params.shiftKey, params.metaKey,\n          params.keyCode, params.charCode);\n          break;\n        }\n      default:\n        {\n          evt.initEvent(eventType, params.bubbles || false, params.cancelable ||\n          true);\n          break;\n        }\n    }\n    common.defaults(evt, aux);\n    elem.dispatchEvent(evt);\n  },\n\n  /**\n   * @param elem\n   * @param event\n   * @param func\n   * @param bool\n   */\n  bind: function(elem, event, func,\n  newBool) {\n    const bool = newBool || false;\n    if (elem.addEventListener) {\n      elem.addEventListener(event,\n      func, bool);\n    } else if (elem.attachEvent) {\n      elem.attachEvent('on' + event, func);\n    }\n    return dom;\n  },\n\n  /**\n   * @param elem\n   * @param event\n   * @param func\n   * @param bool\n   */\n  unbind:\n  function(elem, event, func, newBool) {\n    const bool = newBool || false;\n    if (elem.removeEventListener) {\n      elem.removeEventListener(event, func, bool);\n    } else if (elem.detachEvent) {\n      elem.detachEvent('on' + event,\n      func);\n    }\n    return dom;\n  },\n\n  /**\n   * @param elem\n   * @param className\n   */\n  addClass:\n  function(elem, className) {\n    if (elem.className === undefined) {\n      elem.className = className;\n    } else\n    if (elem.className !== className) {\n      const classes = elem.className.split(/ +/);\n      if\n      (classes.indexOf(className) === -1) {\n        classes.push(className);\n        elem.className = classes.join('\n      ')\n      .replace(/^\s+/, "").replace(/\s+$/, "");\n      }\n      return dom;\n    },\n\n  /**\n   * @param elem\n   * @param className\n   */\n  removeClass: function(elem, className) {\n    if (className) {\n      if\n      (elem.className === className) {\n        elem.removeAttribute('class');\n      } else {\n        const classes =\n        elem.className.split(/ +/);\n        const index = classes.indexOf(className);\n        if (index !== -1) {\n          classes.splice(index, 1);\n          elem.className = classes.join(' ');\n        }\n      } else {\n        elem.className\n        = undefined;\n      }\n      return dom;\n    },\n\n  hasClass: function(elem, className) {\n    return new\n    RegExp('(?:^|\\\\s+)' + className + '(?:\\\\s+|$)').test(elem.className) || false;\n  },\n\n  /**\n   * @param\n   elem\n   */\n  getWidth: function(elem) {\n    const style = getComputedStyle(elem);\n\n    return\n    cssValueToPixels(style['border-left-width']) +\n    cssValueToPixels(style['border-right-width']) +\n    cssValueToPixels(style['padding-left']) +\n    cssValueToPixels(style['padding-right']) +\n    cssValueToPixels(style.width);\n  },\n\n  /**\n   * @param elem\n   */\n  getHeight: function(elem) {\n    const\n    style = getComputedStyle(elem);\n\n    return\n    cssValueToPixels(style['border-top-width']) +\n    cssValueToPixels(style['border-bottom-width']) +\n    cssValueToPixels(style['padding-top']) +\n    cssValueToPixels(style['padding-bottom']) +\n    cssValueToPixels(style.height);\n  },\n\n  /**\n   * @param\n   el\n   */\n  getOffset: function(el) {\n    let elem = el;\n    const offset = { left: 0, top: 0 };\n    if (elem.offsetParent)\n    {\n      do {\n        offset.left += elem.offsetLeft;\n        offset.top += elem.offsetTop;\n        elem =\n        elem.offsetParent;\n      } while (elem);\n    }\n    return offset;\n  },\n\n  //\n  http://stackoverflow.com/posts/2684561/revisions\n  /**\n   * @param elem\n   */\n  isActive: function(elem)\n  {\n    return elem === document.activeElement && (elem.type || elem.href);\n  }\n\n};\n\nexport default\n  dom;\n",\n  /**\n   * dat-gui JavaScript Controller Library\n   * http://code.google.com/p/dat-gui\n   * Copyright 2011

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Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *\n * you may not use this file except in compliance with the License.\n *\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from './Controller';\nimport dom from './dom/dom';\n\n/**\n * @class Provides a checkbox input to alter the boolean property of an object.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n *\n * @param {string} property The name of the property to be manipulated\n */\n\nexport default class BooleanController extends Controller {\n  constructor(object, property) {\n    super(object, property);\n\n    const _this = this;\n    this.__prev = this.getValue();\n\n    this.__checkbox = document.createElement('input');\n    this.__checkbox.setAttribute('type', 'checkbox');\n\n    function onChange() {\n      _this.setValue(!_this.__prev);\n    }\n\n    dom.bind(this.__checkbox, 'change', onChange, false);\n\n    this.domElement.appendChild(this.__checkbox);\n\n    // Match original value\n    this.updateDisplay();\n  }\n\n  setValue(v) {\n    const toReturn = super.setValue(v);\n    if (this.__onFinishChange) {\n      this.__onFinishChange.call(this, this.getValue());\n    }\n    this.__prev = this.getValue();\n    return toReturn;\n  }\n\n  updateDisplay() {\n    if (this.getValue() === true) {\n      this.__checkbox.setAttribute('checked', 'checked');\n      this.__checkbox.checked = true;\n      this.__prev = true;\n    } else {\n      this.__checkbox.checked = false;\n      this.__prev = false;\n    }\n\n    return super.updateDisplay();\n  }\n}\n\nexport default BooleanController;\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *\n * you may not use this file except in compliance with the License.\n *\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from './Controller';\nimport dom from './dom/dom';\nimport common from './utils/common';\n\n/**\n * @class Provides a select input to alter the property of an object, using a\n * list of accepted values.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n *\n * @param {string} property The name of the property to be manipulated\n *\n * @param {Object|string[]} options A map of labels to acceptable values, or\n * a list of acceptable string values.\n */\n\nexport default class OptionController extends Controller {\n  constructor(object, property, opts) {\n    super(object, property);\n\n    let options = opts;\n\n    const _this = this;\n\n    /**\n     * The drop down menu\n     */\n    @ignore\n    */\n    this.__select = document.createElement('select');\n\n    if (common.isArray(options)) {\n      const map = {};\n      common.each(options, function(element) {\n        map[element] = element;\n      });\n      options = map;\n    }\n\n    common.each(options, function(value, key) {\n      const opt = document.createElement('option');\n      opt.innerHTML = key;\n      opt.setAttribute('value', value);\n      _this.__select.appendChild(opt);\n    });\n\n    // Acknowledge original value\n    this.updateDisplay();\n\n    dom.bind(this.__select, 'change', function() {\n      const desiredValue = this.options[this.selectedIndex].value;\n      _this.setValue(desiredValue);\n    });\n\n    this.domElement.appendChild(this.__select);\n  }\n\n  setValue(v) {\n    const toReturn = super.setValue(v);\n\n    if (this.__onFinishChange) {\n      this.__onFinishChange.call(this, this.getValue());\n    }\n\n    return toReturn;\n  }\n\n  updateDisplay() {\n    if (dom.isActive(this.__select)) return this;\n    // prevent number from updating if user is trying to manually update\n    this.__select.value = this.getValue();\n    return super.updateDisplay();\n  }\n}\n\nexport default OptionController;\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *\n * you may not use this file except in compliance with the License.\n *\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from './Controller';\nimport dom from './dom/dom';\n\n/**\n * @class Provides a text input to alter the string property of an object.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n *\n * @param {string} property The name of the property to be manipulated\n */\n\nexport default class StringController extends Controller {\n  constructor(object, property) {\n    super(object, property);\n\n    const _this = this;\n\n    function onChange() {\n      _this.setValue(_this.__input.value);\n    }\n\n    function onBlur() {\n      if (_this.__onFinishChange) {\n        _this.__onFinishChange.call(_this, _this.getValue());\n      }\n    }\n\n    this.__input = document.createElement('input');\n    this.__input.setAttribute('type', 'text');\n\n    dom.bind(this.__input, 'keyup', onChange);\n    dom.bind(this.__input, 'change', onChange);\n    dom.bind(this.__input, 'blur', onBlur);\n  }\n}

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dom.bind(this.__input, 'keydown', function(e) {\n  if (e.keyCode === 13) {\n    this.blur();\n  }\n});\n\nthis.updateDisplay();\n\nthis.domElement.appendChild(this.__input);\n\nupdateDisplay() {\n  // Stops the caret from moving on account of:\n  // keyup -> setValue -> updateDisplay\n  if (!dom.isActive(this.__input)) {\n    this.__input.value = this.getValue();\n  }\n  return super.updateDisplay();\n}\n\nexport default\nStringController;\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from\n'./Controller';\nimport common from './utils/common';\n\nfunction numDecimals(x) {\n  const _x = x.toString();\n  if (_x.indexOf('.') > -1) {\n    return _x.length - _x.indexOf('.') - 1;\n  }\n  return 0;\n}\n\n/**\n * @class\n * Represents a given property of an object that is a number.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property The name of the property to\n * be manipulated\n * @param {Object} [params] Optional parameters\n * @param {Number} [params.min]\n * Minimum allowed value\n * @param {Number} [params.max] Maximum allowed value\n * @param {Number}\n * [params.step] Increment by which to change value\n *\n\nclass NumberController extends Controller {\n  constructor(object, property, params) {\n    super(object, property);\n\n    const _params = params || {};\n\n    this.__min = _params.min;\n    this.__max = _params.max;\n    this.__step = _params.step;\n\n    if\n    (common.isUndefined(this.__step)) {\n      if (this.initialValue === 0) {\n        this.__impliedStep = 1; // What are\n        we, psychics?\n      } else {\n        // Hey Doug, check this out.\n        this.__impliedStep = Math.pow(10,\n        Math.floor(Math.log(Math.abs(this.initialValue)) / Math.LN10)) / 10;\n      }\n    } else {\n      this.__impliedStep =\n      this.__step;\n    }\n\n    this.__precision = numDecimals(this.__impliedStep);\n  }\n\n  setValue(v) {\n    let _v =\n    v;\n\n    if (this.__min !== undefined && _v < this.__min) {\n      _v = this.__min;\n    } else if (this.__max !==\n    undefined && _v > this.__max) {\n      _v = this.__max;\n    }\n\n    if (this.__step !== undefined && _v %\n    this.__step !== 0) {\n      _v = Math.round(_v / this.__step) * this.__step;\n    }\n\n    return super.setValue(_v);\n  }\n\n  /**\n   * Specify a minimum value for <code>object[property]</code>.\n   *\n   * @param {Number}\n   * minValue The minimum value for\n   * <code>object[property]</code>\n   *\n   * @returns\n   * {dat.controllers.NumberController} this\n   *\n   * @min(minValue) {\n   *   this.__min = minValue;\n   *   return this;\n   * }\n\n  /**\n   * Specify a maximum value for <code>object[property]</code>.\n   *\n   * @param {Number}\n   * maxValue The maximum value for\n   * <code>object[property]</code>\n   *\n   * @returns\n   * {dat.controllers.NumberController} this\n   *\n   * @max(maxValue) {\n   *   this.__max = maxValue;\n   *   return this;\n   * }\n\n  /**\n   * Specify a step value that dat.controllers.NumberController\n   * increments by.\n   *\n   * @param\n   * {Number} stepValue The step value for\n   * dat.controllers.NumberController\n   *\n   * @default if minimum and\n   * maximum specified increment is 1% of the\n   * difference otherwise stepValue is 1\n   *\n   * @returns\n   * {dat.controllers.NumberController} this\n   *\n   * @step(stepValue) {\n   *   this.__step = stepValue;\n   *   this.__impliedStep = stepValue;\n   *   this.__precision = numDecimals(stepValue);\n   *   return this;\n   * }\n\n\nexport\n  default NumberController;\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport NumberController from\n'./NumberController';\nimport dom from './dom/dom';\nimport common from './utils/common';\n\nfunction\n  roundToDecimal(value, decimals) {\n    const tenTo = Math.pow(10, decimals);\n    return Math.round(value * tenTo)\n    / tenTo;\n  }\n\n\n/**\n * @class Represents a given property of an object that is a number and\n * provides an input\n * element with which to manipulate it.\n *\n * @extends dat.controllers.Controller\n *\n * @extends\n * dat.controllers.NumberController\n *\n * @param {Object} object The object to be manipulated\n * @param\n * {string} property The name of the property to be manipulated\n * @param {Object} [params] Optional parameters\n * @param {Number} [params.min] Minimum allowed value\n * @param {Number} [params.max] Maximum\n * allowed value\n * @param {Number} [params.step] Increment by which to change value\n *\n\nclass\n  NumberControllerBox extends NumberController {\n    constructor(object, property, params) {\n      super(object,\n
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property, params);\n\n this.__truncationSuspended = false;\n\n const _this = this;\n\n /**\n * {Number}
Previous mouse y position\n * @ignore\n */\n let prevY;\n\n function onChange() {\n const attempted =
parseFloat(_this.__input.value);\n if (!common.isNaN(attempted)) {\n _this.setValue(attempted);\n }\n
}\n\n function onFinish() {\n if (_this.__onFinishChange) {\n _this.__onFinishChange.call(_this,
_this.getValue());\n }\n }\n\n function onBlur() {\n onFinish();\n }\n\n function onMouseDrag(e) {\n
const diff = prevY - e.clientY;\n _this.setValue(_this.getValue() + diff * _this.__impliedStep);\n\n prevY =
e.clientY;\n }\n\n function onMouseUp() {\n dom.unbind(window, 'mousemove', onMouseDrag);\n
dom.unbind(window, 'mouseup', onMouseUp);\n onFinish();\n }\n\n function onMouseDown(e) {\n
dom.bind(window, 'mousemove', onMouseDrag);\n dom.bind(window, 'mouseup', onMouseUp);\n prevY =
e.clientY;\n }\n\n this.__input = document.createElement('input');\n this.__input.setAttribute('type', 'text');\n
// Makes it so manually specified values are not truncated.\n\n dom.bind(this.__input, 'change', onChange);\n
dom.bind(this.__input, 'blur', onBlur);\n dom.bind(this.__input, 'mousedown', onMouseDown);\n
dom.bind(this.__input, 'keydown', function(e) {\n // When pressing enter, you can be as precise as you want.\n
if (e.keyCode === 13) {\n _this.__truncationSuspended = true;\n this.blur();\n
_this.__truncationSuspended = false;\n onFinish();\n }\n });\n\n this.updateDisplay();\n\n
this.domElement.appendChild(this.__input);\n }\n\n updateDisplay() {\n this.__input.value =
this.__truncationSuspended ? this.getValue() : roundToDecimal(this.getValue(), this.__precision);\n return
super.updateDisplay();\n }\n}\n\nexport default NumberControllerBox;\n", "/*\n * dat-gui JavaScript Controller
Library\n * http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * \n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport NumberController from './NumberController';\n\nimport
dom from './dom/dom';\n\nfunction map(v, i1, i2, o1, o2) {\n return o1 + (o2 - o1) * ((v - i1) / (i2 - i1));\n}\n\n/**\n
* @class Represents a given property of an object that is a number, contains\n * a minimum and maximum, and
provides a slider element with which to\n * manipulate it. It should be noted that the slider element is made up of\n
* <code>&lt;div&gt;</code> tags, <strong>not</strong> the html5\n * <code>&lt;slider&gt;</code> element.\n * \n
* @extends dat.controllers.Controller\n * @extends dat.controllers.NumberController\n * \n * @param {Object}
object The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n *
@param {Number} minValue Minimum allowed value\n * @param {Number} maxValue Maximum allowed
value\n * @param {Number} stepValue Increment by which to change value\n */\n\nclass NumberControllerSlider
extends NumberController {\n constructor(object, property, min, max, step) {\n super(object, property, { min:
min, max: max, step: step });\n\n const _this = this;\n\n this.__background = document.createElement('div');\n
this.__foreground = document.createElement('div');\n\n dom.bind(this.__background, 'mousedown',
onMouseDown);\n dom.bind(this.__background, 'touchstart', onTouchStart);\n\n
dom.addClass(this.__background, 'slider');\n dom.addClass(this.__foreground, 'slider-fg');\n\n function
onMouseDown(e) {\n document.activeElement.blur();\n\n dom.bind(window, 'mousemove', onMouseDrag);\n\n
dom.bind(window, 'mouseup', onMouseUp);\n\n onMouseDrag(e);\n }\n\n function onMouseDrag(e) {\n
e.preventDefault();\n\n const bgRect = _this.__background.getBoundingClientRect();\n\n _this.setValue(\n
map(e.clientX, bgRect.left, bgRect.right, _this.__min, _this.__max)\n );\n\n return false;\n }\n\n function
onMouseUp() {\n dom.unbind(window, 'mousemove', onMouseDrag);\n dom.unbind(window, 'mouseup',
onMouseUp);\n\n if (_this.__onFinishChange) {\n _this.__onFinishChange.call(_this, _this.getValue());\n
}\n }\n\n function onTouchStart(e) {\n if (e.touches.length !== 1) { return; }\n dom.bind(window,
'touchmove', onTouchMove);\n dom.bind(window, 'touchend', onTouchEnd);\n onTouchMove(e);\n }\n\n
function onTouchMove(e) {\n const clientX = e.touches[0].clientX;\n const bgRect =
_this.__background.getBoundingClientRect();\n\n _this.setValue(\n map(clientX, bgRect.left, bgRect.right,
_this.__min, _this.__max)\n );\n }\n\n function onTouchEnd() {\n dom.unbind(window, 'touchmove',
onTouchMove);\n dom.unbind(window, 'touchend', onTouchEnd);\n\n if (_this.__onFinishChange) {\n
_this.__onFinishChange.call(_this, _this.getValue());\n }\n }\n\n this.updateDisplay();\n\n

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this.__background.appendChild(this.__foreground);\n this.domElement.appendChild(this.__background);\n }\n\nupdateDisplay() {\n  const pct = (this.getValue() - this.__min) / (this.__max - this.__min);\n  this.__foreground.style.width = pct * 100 + '%';\n  return super.updateDisplay();\n }\n}\n\nexport default\nNumberControllerSlider;\n"/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from\n './Controller';\nimport dom from './dom/dom';\n\n/**\n * @class Provides a GUI interface to fire a specified\n method, a property of an object.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The\n object to be manipulated\n *\n * @param {string} property The name of the property to be manipulated\n *\n\nclass\nFunctionController extends Controller {\n  constructor(object, property, text) {\n    super(object, property);\n\n    const _this = this;\n\n    this.__button = document.createElement('div');\n    this.__button.innerHTML = text ===\n    undefined ? 'Fire' : text;\n\n    dom.bind(this.__button, 'click', function(e) {\n      e.preventDefault();\n      _this.fire();\n      return false;\n    });\n\n    dom.addClass(this.__button, 'button');\n\n    this.domElement.appendChild(this.__button);\n  }\n\n  fire() {\n    if (this.__onChange) {\n      this.__onChange.call(this);\n    }\n\n    this.getValue().call(this.object);\n\n    if (this.__onFinishChange) {\n      this.__onFinishChange.call(this, this.getValue());\n    }\n  }\n}\n\nexport default FunctionController;\n"/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team,\n Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use\n this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from './Controller';\nimport dom from\n './dom/dom';\nimport Color from './color/Color';\nimport interpret from './color/interpret';\nimport common from\n './utils/common';\n\n/**\n * @class Represents a given property of an object that is a color.\n *\n * @param {Object}\n object\n *\n * @param {string} property\n *\n\nclass ColorController extends Controller {\n  constructor(object,\n property) {\n    super(object, property);\n\n    this.__color = new Color(this.getValue());\n    this.__temp = new\n Color(0);\n\n    const _this = this;\n\n    this.domElement = document.createElement('div');\n\n    dom.makeSelectable(this.domElement, false);\n\n    this.__selector = document.createElement('div');\n    this.__selector.className = 'selector';\n\n    this.__saturation_field = document.createElement('div');\n    this.__saturation_field.className = 'saturation-field';\n\n    this.__field_knob = document.createElement('div');\n    this.__field_knob.className = 'field-knob';\n    this.__field_knob_border = '2px solid ';\n\n    this.__hue_knob =\n document.createElement('div');\n    this.__hue_knob.className = 'hue-knob';\n\n    this.__hue_field =\n document.createElement('div');\n    this.__hue_field.className = 'hue-field';\n\n    this.__input =\n document.createElement('input');\n    this.__input.type = 'text';\n    this.__input_textShadow = '0 1px 1px ';\n\n    dom.bind(this.__input, 'keydown', function(e) {\n      if (e.keyCode === 13) { // on enter\n        onBlur.call(this);\n      }\n    });\n\n    dom.bind(this.__input, 'blur', onBlur);\n\n    dom.bind(this.__selector, 'mousedown', function(* e *)\n {\n      dom\n        .addClass(this, 'drag')\n        .bind(window, 'mouseup', function(* e *) {\n          dom.removeClass(_this.__selector, 'drag');\n        });\n\n      dom.bind(this.__selector, 'touchstart', function(* e\n *)\n {\n      dom\n        .addClass(this, 'drag')\n        .bind(window, 'touchend', function(* e *) {\n          dom.removeClass(_this.__selector, 'drag');\n        });\n\n      const valueField =\n document.createElement('div');\n      common.extend(this.__selector.style, {\n        width: '122px',\n        height:\n '102px',\n        padding: '3px',\n        backgroundColor: '#222',\n        boxShadow: '0px 1px 3px rgba(0,0,0,0.3)'\n      });\n\n      common.extend(this.__field_knob.style, {\n        position: 'absolute',\n        width: '12px',\n        height:\n '12px',\n        border: this.__field_knob_border + (this.__color.v < 0.5 ? '#fff' : '#000'),\n        boxShadow: '0px 1px 3px\n rgba(0,0,0,0.5)',\n        borderRadius: '12px',\n        zIndex: 1\n      });\n\n      common.extend(this.__hue_knob.style, {\n        position: 'absolute',\n        width: '15px',\n        height: '2px',\n        borderRight: '4px solid #fff',\n        zIndex: 1\n      });\n\n      common.extend(this.__saturation_field.style, {\n        width: '100px',\n        height: '100px',\n        border: '1px\n solid #555',\n        marginRight: '3px',\n        display: 'inline-block',\n        cursor: 'pointer'\n      });\n\n      common.extend(valueField.style, {\n        width: '100%',\n        height: '100%',\n        background: 'none'\n      });\n\n

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linearGradient(valueField, 'top', 'rgba(0,0,0,0)', '#000');\n\n common.extend(this.__hue_field.style, {\n width:
'15px',\n height: '100px',\n border: '1px solid #555',\n cursor: 'ns-resize',\n position: 'absolute',\n top:
'3px',\n right: '3px'\n });\n\n hueGradient(this.__hue_field);\n\n common.extend(this.__input.style, {\n
outline: 'none',\n// width: '120px',\n textAlign: 'center',\n// padding: '4px',\n// marginBottom: '6px',\n
color: '#fff',\n border: 0,\n fontWeight: 'bold',\n textShadow: this.__input_textShadow + 'rgba(0,0,0,0.7)'\n
});\n\n dom.bind(this.__saturation_field, 'mousedown', fieldDown);\n dom.bind(this.__saturation_field,
'touchstart', fieldDown);\n\n dom.bind(this.__field_knob, 'mousedown', fieldDown);\n
dom.bind(this.__field_knob, 'touchstart', fieldDown);\n\n dom.bind(this.__hue_field, 'mousedown',
fieldDownH);\n dom.bind(this.__hue_field, 'touchstart', fieldDownH);\n\n function fieldDown(e) {\n
setSV(e);\n dom.bind(window, 'mousemove', setSV);\n dom.bind(window, 'touchmove', setSV);\n
dom.bind(window, 'mouseup', fieldUpSV);\n dom.bind(window, 'touchend', fieldUpSV);\n }\n\n function
fieldDownH(e) {\n setH(e);\n dom.bind(window, 'mousemove', setH);\n dom.bind(window, 'touchmove',
setH);\n dom.bind(window, 'mouseup', fieldUpH);\n dom.bind(window, 'touchend', fieldUpH);\n }\n\n
function fieldUpSV() {\n dom.unbind(window, 'mousemove', setSV);\n dom.unbind(window, 'touchmove',
setSV);\n dom.unbind(window, 'mouseup', fieldUpSV);\n dom.unbind(window, 'touchend', fieldUpSV);\n
onFinish();\n }\n\n function fieldUpH() {\n dom.unbind(window, 'mousemove', setH);\n
dom.unbind(window, 'touchmove', setH);\n dom.unbind(window, 'mouseup', fieldUpH);\n
dom.unbind(window, 'touchend', fieldUpH);\n onFinish();\n }\n\n function onBlur() {\n const i =
interpret(this.value);\n if (i !== false) {\n __this.__color.__state = i;\n
__this.setValue(__this.__color.toOriginal());\n } else {\n this.value = __this.__color.toString();\n }\n }\n\n
function onFinish() {\n if (__this.__onFinishChange) {\n __this.__onFinishChange.call(__this,
__this.__color.toOriginal());\n }\n }\n\n this.__saturation_field.appendChild(valueField);\n
this.__selector.appendChild(this.__field_knob);\n this.__selector.appendChild(this.__saturation_field);\n
this.__selector.appendChild(this.__hue_field);\n this.__hue_field.appendChild(this.__hue_knob);\n\n
this.domElement.appendChild(this.__input);\n this.domElement.appendChild(this.__selector);\n\n
this.updateDisplay();\n\n function setSV(e) {\n if (e.type.indexOf('touch') === -1) { e.preventDefault(); }\n\n
const fieldRect = __this.__saturation_field.getBoundingClientRect();\n const { clientX, clientY } = (e.touches &&
e.touches[0]) || e;\n let s = (clientX - fieldRect.left) / (fieldRect.right - fieldRect.left);\n let v = 1 - (clientY -
fieldRect.top) / (fieldRect.bottom - fieldRect.top);\n\n if (v > 1) {\n v = 1;\n } else if (v < 0) {\n v =
0;\n }\n\n if (s > 1) {\n s = 1;\n } else if (s < 0) {\n s = 0;\n }\n\n __this.__color.v = v;\n
__this.__color.s = s;\n\n __this.setValue(__this.__color.toOriginal());\n\n return false;\n }\n\n function
setH(e) {\n if (e.type.indexOf('touch') === -1) { e.preventDefault(); }\n\n const fieldRect =
__this.__hue_field.getBoundingClientRect();\n const { clientY } = (e.touches && e.touches[0]) || e;\n let h = 1 -
(clientY - fieldRect.top) / (fieldRect.bottom - fieldRect.top);\n\n if (h > 1) {\n h = 1;\n } else if (h < 0)
{\n h = 0;\n }\n\n __this.__color.h = h * 360;\n\n __this.setValue(__this.__color.toOriginal());\n\n
return false;\n }\n }\n\n updateDisplay() {\n const i = interpret(this.getValue());\n\n if (i !== false) {\n let
mismatch = false;\n\n // Check for mismatch on the interpreted value.\n\n
common.each(Color.COMPONENTS, function(component) {\n if (!common.isUndefined(i[component]) &&
!common.isUndefined(this.__color.__state[component]) &&\n i[component] !==
this.__color.__state[component]) {\n mismatch = true;\n return {}; // break\n }\n }, this);\n\n //
If nothing diverges, we keep our previous values\n // for statefulness, otherwise we recalculate fresh\n if
(mismatch) {\n common.extend(this.__color.__state, i);\n }\n }\n\n common.extend(this.__temp.__state,
this.__color.__state);\n\n this.__temp.a = 1;\n\n const flip = (this.__color.v < 0.5 || this.__color.s > 0.5) ? 255 :
0;\n const _flip = 255 - flip;\n\n common.extend(this.__field_knob.style, {\n marginLeft: 100 * this.__color.s
- 7 + 'px',\n marginTop: 100 * (1 - this.__color.v) - 7 + 'px',\n backgroundColor: this.__temp.toHexString(),\n
border: this.__field_knob_border + 'rgb(' + flip + ',' + flip + ',' + flip + ')'\n });\n\n
this.__hue_knob.style.marginTop = (1 - this.__color.h / 360) * 100 + 'px';\n\n this.__temp.s = 1;\n this.__temp.v
= 1;\n\n linearGradient(this.__saturation_field, 'left', '#fff', this.__temp.toHexString());\n\n this.__input.value =

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this.__color.toString();\n\n  common.extend(this.__input.style, {\n    backgroundColor:
this.__color.toHexString(),\n    color: 'rgb(' + flip + ',' + flip + ',' + flip + '),\n    textShadow:
this.__input_textShadow + 'rgba(' + _flip + ',' + _flip + ',' + _flip + ',.7)\n  });\n  }\n}\n\nconst vendors = ['-moz-', '-
o-', '-webkit-', '-ms-', ''];\n\nfunction linearGradient(elem, x, a, b) {\n  elem.style.background = ";\n
common.each(vendors, function(vendor) {\n  elem.style.cssText += 'background: ' + vendor + 'linear-gradient(' + x
+ ', ' + a + ' 0%, ' + b + ' 100%);';\n  });\n}\n\nfunction hueGradient(elem) {\n  elem.style.background = ";\n
elem.style.cssText += 'background: -moz-linear-gradient(top, #ff0000 0%, #ff00ff 17%, #0000ff 34%, #00ffff 50%,
#00ff00 67%, #ffff00 84%, #ff0000 100%);';\n  elem.style.cssText += 'background: -webkit-linear-gradient(top,
#ff0000 0%, #ff00ff 17%, #0000ff 34%, #00ffff 50%, #00ff00 67%, #ffff00 84%, #ff0000 100%);';\n
elem.style.cssText += 'background: -o-linear-gradient(top, #ff0000 0%, #ff00ff 17%, #0000ff 34%, #00ffff
50%, #00ff00 67%, #ffff00 84%, #ff0000 100%);';\n  elem.style.cssText += 'background: -ms-linear-gradient(top,
#ff0000 0%, #ff00ff 17%, #0000ff 34%, #00ffff 50%, #00ff00 67%, #ffff00 84%, #ff0000 100%);';\n
elem.style.cssText += 'background: linear-gradient(top, #ff0000 0%, #ff00ff 17%, #0000ff 34%, #00ffff 50%, #00ff00
67%, #ffff00 84%, #ff0000 100%);';\n}\n\nexport default ColorController;\n", "/**\n * dat-gui JavaScript Controller
Library\n * http://code.google.com/p/dat-gui/\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * \n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n\nconst css = {\n  load: function(url, indoc) {\n    const doc =
indoc || document;\n    const link = doc.createElement('link');\n    link.type = 'text/css';\n    link.rel = 'stylesheet';\n
link.href = url;\n    doc.getElementsByTagName('head')[0].appendChild(link);\n  },\n  inject: function(cssContent,
indoc) {\n    const doc = indoc || document;\n    const injected = document.createElement('style');\n    injected.type =
'text/css';\n    injected.innerHTML = cssContent;\n    const head = doc.getElementsByTagName('head')[0];\n    try
{\n      head.appendChild(injected);\n    } catch (e) { // Unable to inject CSS, probably because of a Content Security
Policy\n    }\n  }\n};\n\nexport default css;\n", "const saveDialogContent = `<div id="dg-save" class="dg
dialogue">\n\n  Here's the new load parameter for your <code>GUI</code>'s constructor:\n\n  <textarea id="dg-
new-constructor"></textarea>\n\n  <div id="dg-save-locally">\n\n    <input id="dg-local-storage"
type="checkbox"/> Automatically save\n    values to <code>localStorage</code> on exit.\n\n    <div id="dg-local-
explain">The values saved to <code>localStorage</code> will\n    override those passed to
<code>dat.GUI</code>'s constructor. This makes it\n    easier to work incrementally, but
<code>localStorage</code> is fragile,\n    and your friends may not see the same values you do.\n\n  </div>\n\n</div>\n\n</div>`;
\n\nexport default saveDialogContent;\n", "/**\n * dat-gui JavaScript Controller Library\n *
http://code.google.com/p/dat-gui/\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * \n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport OptionController from './OptionController';\nimport NumberControllerBox from
 './NumberControllerBox';\nimport NumberControllerSlider from './NumberControllerSlider';\nimport
StringController from './StringController';\nimport FunctionController from './FunctionController';\nimport
BooleanController from './BooleanController';\nimport common from '../utils/common';\n\nconst ControllerFactory
= function(object, property) {\n  const initialValue = object[property];\n\n  // Providing options?\n  if
(common.isArray(arguments[2]) || common.isObject(arguments[2])) {\n    return new OptionController(object,
property, arguments[2]);\n  }\n\n  // Providing a map?\n  if (common.isNumber(initialValue)) {\n    // Has min and
max? (slider)\n    if (common.isNumber(arguments[2]) && common.isNumber(arguments[3])) {\n      // has step?\n
      if (common.isNumber(arguments[4])) {\n        return new NumberControllerSlider(object, property,\n        arguments[2], arguments[3], arguments[4]);\n      }\n      return new NumberControllerSlider(object, property,
arguments[2], arguments[3]);\n    }\n\n    // number box\n    if (common.isNumber(arguments[4])) { // has step\n
return new NumberControllerBox(object, property,\n      { min: arguments[2], max: arguments[3], step:
arguments[4] });\n    }\n    return new NumberControllerBox(object, property, { min: arguments[2], max:
arguments[3] });\n  }\n\n  if (common.isString(initialValue)) {\n    return new StringController(object, property);\n

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}\n\n if (common.isFunction(initialValue)) {\n  return new FunctionController(object, property, ");\n }\n\n if
(common.isBoolean(initialValue)) {\n  return new BooleanController(object, property);\n }\n\n return
null;\n};\n\nexport default ControllerFactory;\n", "/*\n * dat-gui JavaScript Controller Library\n *
http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n
*/\n\nfunction requestAnimationFrame(callback) {\n  setTimeout(callback, 1000 / 60);\n}\n\nexport default
window.requestAnimationFrame ||\n window.webkitRequestAnimationFrame ||\n window.mozRequestAnimationFrame ||\n window.oRequestAnimationFrame ||\n window.msRequestAnimationFrame ||\n requestAnimationFrame;\n", "/*\n * dat-gui JavaScript Controller
Library\n * http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n
*/\n\nimport dom from './dom/dom';\nimport common from
 './utils/common';\n\nclass CenteredDiv {\n  constructor() {\n    this.backgroundElement =
document.createElement('div');\n    common.extend(this.backgroundElement.style, {\n      backgroundColor:
'rgba(0,0,0,0.8)',\n      top: 0,\n      left: 0,\n      display: 'none',\n      zIndex: '1000',\n      opacity: 0,\n      WebkitTransition: 'opacity 0.2s linear',\n      transition: 'opacity 0.2s linear'\n    });\n\n    dom.makeFullscreen(this.backgroundElement);\n    this.backgroundElement.style.position = 'fixed';\n\n    this.domElement = document.createElement('div');\n    common.extend(this.domElement.style, {\n      position:
'fixed',\n      display: 'none',\n      zIndex: '1001',\n      opacity: 0,\n      WebkitTransition: '-webkit-transform 0.2s
ease-out, opacity 0.2s linear',\n      transition: 'transform 0.2s ease-out, opacity 0.2s linear'\n    });\n\n    document.body.appendChild(this.backgroundElement);\n    document.body.appendChild(this.domElement);\n\n    const _this = this;\n    dom.bind(this.backgroundElement, 'click', function() {\n      _this.hide();\n    });\n  }\n\n  show() {\n    const _this = this;\n\n    this.backgroundElement.style.display = 'block';\n\n    this.domElement.style.display = 'block';\n    this.domElement.style.opacity = 0;\n\n    // this.domElement.style.top =
'52%';\n    this.domElement.style.webkitTransform = 'scale(1.1)';\n\n    this.layout();\n\n    common.defer(function()
{\n      _this.backgroundElement.style.opacity = 1;\n      _this.domElement.style.opacity = 1;\n\n      _this.domElement.style.webkitTransform = 'scale(1)';\n    });\n  }\n\n  hide() {\n    const _this = this;\n\n    const hide = function() {\n      _this.domElement.style.display = 'none';\n      _this.backgroundElement.style.display = 'none';\n\n      dom.unbind(_this.domElement, 'webkitTransitionEnd',
hide);\n      dom.unbind(_this.domElement, 'transitionend', hide);\n      dom.unbind(_this.domElement,
'oTransitionEnd', hide);\n    };\n\n    dom.bind(this.domElement, 'webkitTransitionEnd', hide);\n    dom.bind(this.domElement, 'transitionend', hide);\n    dom.bind(this.domElement, 'oTransitionEnd', hide);\n\n    this.backgroundElement.style.opacity = 0;\n\n    // this.domElement.style.top = '48%';\n\n    this.domElement.style.opacity = 0;\n    this.domElement.style.webkitTransform = 'scale(1.1)';\n  }\n\n  layout() {\n    this.domElement.style.left = window.innerWidth / 2 - dom.getWidth(this.domElement) / 2 + 'px';\n\n    this.domElement.style.top = window.innerHeight / 2 - dom.getHeight(this.domElement) / 2 + 'px';\n  }\n}\n\nexport
default CenteredDiv;\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *
Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport css from './utils/css';\nimport
saveDialogueContents from './saveDialogue.html';\nimport ControllerFactory from
 './controllers/ControllerFactory';\nimport Controller from './controllers/Controller';\nimport BooleanController
from './controllers/BooleanController';\nimport FunctionController from './controllers/FunctionController';\nimport
NumberControllerBox from './controllers/NumberControllerBox';\nimport NumberControllerSlider from
 './controllers/NumberControllerSlider';\nimport ColorController from './controllers/ColorController';\nimport
requestAnimationFrame from './utils/requestAnimationFrame';\nimport CenteredDiv from

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'./dom/CenteredDiv';\nimport dom from './dom/dom';\nimport common from './utils/common';\n\nimport
StyleSheet from './style.scss'; // CSS to embed in build\n\nccss.inject(StyleSheet);\n\n/** @ignore Outer-most
className for GUI's *\n\nconst CSS_NAMESPACE = 'dg';\n\nconst HIDE_KEY_CODE = 72;\n\n/** @ignore The
only value shared between the JS and SCSS. Use caution. *\n\nconst CLOSE_BUTTON_HEIGHT = 20;\n\nconst
DEFAULT_DEFAULT_PRESET_NAME = 'Default';\n\nconst SUPPORTS_LOCAL_STORAGE = (function() {\n
try {\n
return !!window.localStorage;\n
} catch (e) {\n
return false;\n
}\n\n})();\n\nlet
SAVE_DIALOGUE;\n\n/** @ignore Have we yet to create an autoPlace GUI? *\n\nlet autoPlaceVirgin =
true;\n\n/** @ignore Fixed position div that auto place GUI's go inside *\n\nlet autoPlaceContainer;\n\n/** @ignore
Are we hiding the GUI's ? *\n\nlet hide = false;\n\n/** @private GUI's which should be hidden *\n\nconst
hideableGuis = [];\n\n/**\n
 * @class A lightweight controller library for JavaScript. It allows you to easily\n
 * manipulate variables and fire functions on the fly.\n
 * *\n
 * @typicalname gui\n
 * *\n
 * @example\n
 * // Creating a
GUI with options.\n
 * var gui = new dat.GUI({name: 'My GUI'});\n
 * *\n
 * @example\n
 * // Creating a GUI and
a subfolder.\n
 * var gui = new dat.GUI();\n
 * var folder1 = gui.addFolder('Flow Field');\n
 * *\n
 * @param {Object}
[params]\n
 * @param {String} [params.name] The name of this GUI.\n
 * @param {Object} [params.load] JSON
object representing the saved state of\n
 * this GUI.\n
 * @param {dat.gui.GUI} [params.parent] The GUI I'm nested
in.\n
 * @param {Boolean} [params.autoPlace=true]\n
 * @param {Boolean} [params.hideable=true] If true, GUI is
shown/hidden by <kbd>h</kbd> keypress.\n
 * @param {Boolean} [params.closed=false] If true, starts closed\n
 * @param {Boolean} [params.closeOnTop=false] If true, close/open button shows on top of the GUI\n
 *\n\nconst GUI
= function(pars) {\n
const _this = this;\n
let params = pars || {};\n
\n /**\n
 * Outermost DOM Element\n
 * @type {DOMELEMENT}\n
 * *\n
this.domElement = document.createElement('div');\n
this.__ul =
document.createElement('ul');\n
this.domElement.appendChild(this.__ul);\n
dom.addClass(this.domElement,
CSS_NAMESPACE);\n
\n /**\n
 * Nested GUI's by name\n
 * @ignore\n
 * *\n
this.__folders = {};\n
\n
this.__controllers = [];\n
\n /**\n
 * List of objects I'm remembering for save, only used in top level GUI\n
 * @ignore\n
 * *\n
this.__rememberedObjects = [];\n
\n /**\n
 * Maps the index of remembered objects to a map of
controllers, only used\n
 * in top level GUI.\n
 * *\n
 * @private\n
 * @ignore\n
 * *\n
 * @example\n
 * [\n
 * { \n
 * propertyName: Controller,\n
 * anotherPropertyName: Controller\n
 * },\n
 * { \n
 * propertyName:
Controller\n
 * }\n
 * ]\n
 * *\n
this.__rememberedObjectIndecesToControllers = [];\n
\n this.__listening = [];\n
\n // Default parameters\n
params = common.defaults(params, {\n
closeOnTop: false,\n
autoPlace: true,\n
width:
GUI.DEFAULT_WIDTH\n
});\n
\n params = common.defaults(params, {\n
resizable: params.autoPlace,\n
hideable: params.autoPlace\n
});\n
\n if (!common.isUndefined(params.load)) {\n
// Explicit preset\n
if
(params.preset) {\n
params.load.preset = params.preset;\n
}\n
} else {\n
params.load = { preset:
DEFAULT_DEFAULT_PRESET_NAME }; \n
}\n
\n if (common.isUndefined(params.parent) &&
params.hideable) {\n
hideableGuis.push(this);\n
}\n
\n // Only root level GUI's are resizable.\n
params.resizable =
common.isUndefined(params.parent) && params.resizable;\n
\n if (params.autoPlace &&
common.isUndefined(params.scrollable)) {\n
params.scrollable = true;\n
}\n
\n // params.scrollable =
common.isUndefined(params.parent) && params.scrollable === true;\n
\n // Not part of params because I don't
want people passing this in via\n
// constructor. Should be a 'remembered' value.\n
let useLocalStorage =\n
SUPPORTS_LOCAL_STORAGE &&\n
localStorage.getItem(getLocalStorageHash(this, 'isLocal')) ===
'true';\n
\n let saveToLocalStorage;\n
let titleRow;\n
\n Object.defineProperties(this, \n
\n /** @lends GUI.prototype
*\n
 * *\n
 * The parent <code>GUI</code>\n
 * @type dat.gui.GUI\n
 * *\n
parent: {\n
get: function() {\n
return params.parent;\n
}\n
},\n
\n scrollable: {\n
get: function() {\n
return params.scrollable;\n
}\n
},\n
\n /**\n
 * Handles <code>GUI</code>'s element placement for
you\n
 * @type Boolean\n
 * *\n
autoPlace: {\n
get: function() {\n
return params.autoPlace;\n
}\n
},\n
\n /**\n
 * Handles <code>GUI</code>'s position of open/close button\n
 * @type Boolean\n
 * *\n
closeOnTop: {\n
get: function() {\n
return params.closeOnTop;\n
}\n
},\n
\n /**\n
 *
The identifier for a set of saved values\n
 * @type String\n
 * *\n
preset: {\n
get: function() {\n
if
(_this.parent) {\n
return _this.getRoot().preset;\n
}\n
\n
return params.load.preset;\n
}\n
},\n
\n
set: function(v) {\n
if (_this.parent) {\n
_this.getRoot().preset = v;\n
}\n
} else {\n

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params.load.preset = v;\n      }\n      setPresetSelectIndex(this);\n      _this.revert();\n      }\n      },\n\n  /**\n   * The width of <code>GUI</code> element\n   * @type Number\n   */\n  width: {\n    get:\n  function() {\n    return params.width;\n  },\n  set: function(v) {\n    params.width = v;\n  }\n},\n\n  /**\n   * The name of <code>GUI</code>. Used for folders. i.e\n   * a folder's name\n   * @type String\n   */\n  name: {\n    get: function() {\n      return params.name;\n    },\n    set: function(v) {\n      // TODO Check for collisions among sibling folders\n      params.name = v;\n      if (titleRow) {\n        titleRow.innerHTML = params.name;\n      }\n    },\n  },\n\n  /**\n   * Whether\n   the <code>GUI</code> is collapsed or not\n   * @type Boolean\n   */\n  closed: {\n    get: function() {\n      return params.closed;\n    },\n    set: function(v) {\n      params.closed = v;\n      if (params.closed) {\n        dom.addClass(_this.__ul, GUI.CLASS_CLOSED);\n      } else {\n        dom.removeClass(_this.__ul,\n        GUI.CLASS_CLOSED);\n      }\n      // For browsers that aren't going to respect the CSS transition,\n      // Lets just check our height against the window height right off\n      // the bat.\n      this.onResize();\n    }\n  },\n\n  __closeButton: {\n    __closeButton.innerHTML = v ? GUI.TEXT_OPEN :\n    GUI.TEXT_CLOSED;\n  },\n\n  /**\n   * Contains all presets\n   * @type Object\n   */\n  load: {\n    get: function() {\n      return params.load;\n    },\n  },\n\n  /**\n   * Determines\n   whether or not to use <a href="https://developer.mozilla.org/en/DOM/Storage#localStorage">localStorage</a>\n   as the means for\n   * <code>remember</code>ing\n   * @type Boolean\n   */\n  useLocalStorage: {\n    get: function() {\n      return useLocalStorage;\n    },\n    set: function(bool) {\n      if\n      (SUPPORTS_LOCAL_STORAGE) {\n        useLocalStorage = bool;\n        if (bool) {\n          dom.bind(window, 'unload', saveToLocalStorage);\n        } else {\n          dom.unbind(window, 'unload',\n          saveToLocalStorage);\n        }\n        localStorage.setItem(getLocalStorageHash(_this, 'isLocal'), bool);\n      }\n    }\n  },\n\n  // Are we a root level GUI?\n  if (common.isUndefined(params.parent)) {\n    this.closed = params.closed || false;\n    dom.addClass(this.domElement, GUI.CLASS_MAIN);\n    dom.makeSelectable(this.domElement, false);\n    // Are we supposed to be loading locally?\n    if\n    (SUPPORTS_LOCAL_STORAGE) {\n      if (useLocalStorage) {\n        _this.useLocalStorage = true;\n        const\n        savedGui = localStorage.getItem(getLocalStorageHash(this, 'gui'));\n        if (savedGui) {\n          params.load =\n          JSON.parse(savedGui);\n        }\n      }\n      this.__closeButton = document.createElement('div');\n      this.__closeButton.innerHTML = GUI.TEXT_CLOSED;\n      dom.addClass(this.__closeButton,\n      GUI.CLASS_CLOSE_BUTTON);\n      if (params.closeOnTop) {\n        dom.addClass(this.__closeButton,\n        GUI.CLASS_CLOSE_TOP);\n        this.domElement.insertBefore(this.__closeButton,\n        this.domElement.childNodes[0]);\n      } else {\n        dom.addClass(this.__closeButton,\n        GUI.CLASS_CLOSE_BOTTOM);\n        this.domElement.appendChild(this.__closeButton);\n      }\n      dom.bind(this.__closeButton, 'click', function() {\n        _this.closed = !_this.closed;\n      });\n      // Oh, you're a nested\n      GUI!\n    } else {\n      if (params.closed === undefined) {\n        params.closed = true;\n      }\n      const titleRowName\n      = document.createTextNode(params.name);\n      dom.addClass(titleRowName, 'controller-name');\n      titleRow =\n      addRow(_this, titleRowName);\n      const onClickTitle = function(e) {\n        e.preventDefault();\n        _this.closed =\n        !_this.closed;\n        return false;\n      };\n      dom.addClass(this.__ul, GUI.CLASS_CLOSED);\n      dom.addClass(titleRow, 'title');\n      dom.bind(titleRow, 'click', onClickTitle);\n      if (!params.closed) {\n        this.closed = false;\n      }\n    }\n    if (params.autoPlace) {\n      if (common.isUndefined(params.parent)) {\n        if\n        (autoPlaceVirgin) {\n          autoPlaceContainer = document.createElement('div');\n          dom.addClass(autoPlaceContainer, CSS_NAMESPACE);\n          dom.addClass(autoPlaceContainer,\n          GUI.CLASS_AUTO_PLACE_CONTAINER);\n          document.body.appendChild(autoPlaceContainer);\n          autoPlaceVirgin = false;\n        }\n        // Put it in the dom for you.\n        autoPlaceContainer.appendChild(this.domElement);\n        // Apply the auto styles\n        dom.addClass(this.domElement, GUI.CLASS_AUTO_PLACE);\n      }\n      // Make it not elastic.\n      if\n      (!this.parent) {\n        setWidth(_this, params.width);\n      }\n    }\n    this.__resizeHandler = function() {\n      _this.onResizeDebounce();\n    };\n    dom.bind(window, 'resize', this.__resizeHandler);\n    dom.bind(this.__ul,\n    'webkitTransitionEnd', this.__resizeHandler);\n    dom.bind(this.__ul, 'transitionend', this.__resizeHandler);\n  }

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dom.bind(this.__ul, 'oTransitionEnd', this.__resizeHandler);
this.onResize();

if (params.resizable) {
  addResizeHandle(this);
  saveToLocalStorage = function() {
    if (SUPPORTS_LOCAL_STORAGE &&
        localStorage.getItem(getLocalStorageHash(_this, 'isLocal')) === 'true') {
      localStorage.setItem(getLocalStorageHash(_this, 'gui'), JSON.stringify(_this.getSaveObject()));
    }
  };

  // expose this method publicly
  this.saveToLocalStorageIfPossible = saveToLocalStorage;

  function resetWidth() {
    const root = _this.getRoot();
    root.width += 1;
    common.defer(function() {
      root.width -= 1;
    });
  }

  if (!params.parent) {
    resetWidth();
  }

  GUI.toggleHide = function() {
    hide = !hide;
    common.each(hideableGuis, function(gui) {
      gui.domElement.style.display = hide ? 'none' : '';
    });
  };

  GUI.CLASS_AUTO_PLACE = 'a';
  GUI.CLASS_AUTO_PLACE_CONTAINER = 'ac';
  GUI.CLASS_MAIN = 'main';
  GUI.CLASS_CONTROLLER_ROW = 'cr';
  GUI.CLASS_TOO_TALL = 'taller-than-window';
  GUI.CLASS_CLOSED = 'closed';
  GUI.CLASS_CLOSE_BUTTON = 'close-button';
  GUI.CLASS_CLOSE_TOP = 'close-top';
  GUI.CLASS_CLOSE_BOTTOM = 'close-bottom';
  GUI.CLASS_DRAG = 'drag';
  GUI.DEFAULT_WIDTH = 245;
  GUI.TEXT_CLOSED = 'Close Controls';
  GUI.TEXT_OPEN = 'Open Controls';

  GUI._keydownHandler = function(e) {
    if (document.activeElement.type !== 'text' &&
        (e.which === HIDE_KEY_CODE || e.keyCode === HIDE_KEY_CODE)) {
      GUI.toggleHide();
    }
  };

  dom.bind(window, 'keydown', GUI._keydownHandler, false);

  common.extend(GUI.prototype, /** @lends GUI.prototype */ {
    /**
     * Adds a new {@link Controller} to the GUI. The type of controller created
     * is inferred from the initial value of <code>object[property]</code>. For
     * color properties, see {@link addColor}.
     * @param {Object} object The object to be manipulated
     * @param {String} property The name of the property to be manipulated
     * @param {Number} [min] Minimum allowed value
     * @param {Number} [max] Maximum allowed value
     * @param {Number} [step] Increment by which to change value
     * @returns {Controller} The controller that was added to the GUI.
     * @instance
     * @example
     * // Add a string controller.
     * var person = {name: 'Sam'};
     * gui.add(person, 'name');
     * @example
     * // Add a number controller slider.
     * var person = {age: 45};
     * gui.add(person, 'age', 0, 100);
     * ^
     * add: function(object, property) {
     *   return add(this, object, property, {
     *     factoryArgs: Array.prototype.slice.call(arguments, 2)
     *   });
     * },
     * /**
     * Adds a new color controller to the GUI.
     * @param object
     * @param property
     * @returns {Controller} The controller that was added to the GUI.
     * @instance
     * @example
     * var palette = {
     *   color1: '#FF0000', // CSS string
     *   color2: [ 0, 128, 255 ], // RGB array
     *   color3: [ 0, 128, 255, 0.3 ], // RGB with alpha
     *   color4: { h: 350, s: 0.9, v: 0.3 } // Hue, saturation, value
     * };
     * gui.addColor(palette, 'color1');
     * gui.addColor(palette, 'color2');
     * gui.addColor(palette, 'color3');
     * gui.addColor(palette, 'color4');
     * ^
     * addColor: function(object, property) {
     *   return add(this, object, property, {
     *     color: true
     *   });
     * },
     * /**
     * Removes the given controller from the GUI.
     * @param {Controller} controller
     * @instance
     * ^
     * remove: function(controller) {
     *   // TODO listening?
     *   this.__ul.removeChild(controller.__li);
     *   this.__controllers.splice(this.__controllers.indexOf(controller), 1);
     *   const _this = this;
     *   common.defer(function() {
     *     _this.onResize();
     *   });
     * },
     * /**
     * Removes the root GUI from the document and unbinds all event listeners.
     * For subfolders, use `gui.removeFolder(folder)` instead.
     * @instance
     * ^
     * destroy: function() {
     *   if (this.parent) {
     *     throw new Error('Only the root GUI should be removed with .destroy(). ' +
     *       'For subfolders, use gui.removeFolder(folder) instead. ');
     *   }
     *   if (this.autoPlace) {
     *     autoPlaceContainer.removeChild(this.domElement);
     *   }
     *   const _this = this;
     *   common.each(this.__folders, function(subfolder) {
     *     _this.removeFolder(subfolder);
     *   });
     *   dom.unbind(window, 'keydown', GUI._keydownHandler, false);
     *   removeListeners(this);
     * },
     * /**
     * Creates a new subfolder GUI instance.
     * @param name
     * @returns {dat.gui.GUI} The new folder.
     * @throws {Error} if this GUI already has a folder by the specified
     * name
     * @instance
     * ^
     * addFolder: function(name) {
     *   // We have to prevent collisions on names in order to have a key
     *   // by which to remember saved values
     *   if (this.__folders[name] !== undefined) {
     *     throw new Error('You already have a folder in this GUI by the ' +
     *       ' name \'' + name + '\');
     *   }
     *   const newGuiParams = { name: name,

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parent: this };\n\n // We need to pass down the autoPlace trait so that we can\n // attach event listeners to\n open/close folder actions to\n // ensure that a scrollbar appears if the window is too short.\n newGuiParams.autoPlace = this.autoPlace;\n // Do we have saved appearance data for this folder?\n if\n (this.load && // Anything loaded?\n this.load.folders && // Was my parent a dead-end?\n this.load.folders[name]) { // Did daddy remember me?\n // Start me closed if I was closed\n newGuiParams.closed = this.load.folders[name].closed;\n // Pass down the loaded data\n newGuiParams.load = this.load.folders[name];\n }\n const gui = new GUI(newGuiParams);\n this.__folders[name] = gui;\n const li = addRow(this, gui.domElement);\n dom.addClass(li, 'folder');\n return gui;\n },\n\n /**\n * Removes a subfolder GUI instance.\n * @param {dat.gui.GUI} folder The\n folder to remove.\n * @instance\n */\n removeFolder: function(folder) {\n this.__ul.removeChild(folder.domElement.parentElement);\n delete this.__folders[folder.name];\n // Do\n we have saved appearance data for this folder?\n if (this.load && // Anything loaded?\n this.load.folders &&\n // Was my parent a dead-end?\n this.load.folders[folder.name]) {\n delete this.load.folders[folder.name];\n }\n removeListeners(folder);\n const _this = this;\n common.each(folder.__folders,\n function(subfolder) {\n folder.removeFolder(subfolder);\n });\n common.defer(function() {\n _this.onResize();\n });\n },\n\n /**\n * Opens the GUI.\n */\n open: function() {\n this.closed =\n false;\n },\n\n /**\n * Closes the GUI.\n */\n close: function() {\n this.closed = true;\n },\n\n /**\n * Hides the GUI.\n */\n hide: function() {\n this.domElement.style.display = 'none';\n },\n\n /**\n * Shows the GUI.\n */\n show: function() {\n this.domElement.style.display = '';\n },\n\n onResize:\n function() {\n // we debounce this function to prevent performance issues when rotating on tablet/mobile\n const root = this.getRoot();\n if (root.scrollable) {\n const top = dom.getOffset(root.__ul).top;\n let h =\n 0;\n common.each(root.__ul.childNodes, function(node) {\n if (!(root.autoPlace && node ===\n root.__save_row)) {\n h += dom.getHeight(node);\n }\n });\n if (window.innerHeight - top -\n CLOSE_BUTTON_HEIGHT < h) {\n dom.addClass(root.domElement, GUI.CLASS_TOO_TALL);\n root.__ul.style.height = window.innerHeight - top - CLOSE_BUTTON_HEIGHT + 'px';\n } else {\n dom.removeClass(root.domElement, GUI.CLASS_TOO_TALL);\n root.__ul.style.height = 'auto';\n }\n }\n if (root.__resize_handle) {\n common.defer(function() {\n root.__resize_handle.style.height =\n root.__ul.offsetHeight + 'px';\n });\n }\n if (root.__closeButton) {\n root.__closeButton.style.width\n = root.width + 'px';\n }\n },\n\n onResizeDebounce: common.debounce(function() { this.onResize(); },\n 50),\n\n /**\n * Mark objects for saving. The order of these objects cannot change as\n * the GUI grows.\n When remembering new objects, append them to the end\n * of the list.\n */\n * @param {...Object}\n objects\n * @throws {Error} if not called on a top level GUI.\n * @instance\n * @ignore\n */\n remember: function() {\n if (common.isUndefined(SAVE_DIALOGUE)) {\n SAVE_DIALOGUE = new\n CenteredDiv();\n SAVE_DIALOGUE.domElement.innerHTML = saveDialogueContents;\n }\n if\n (this.parent) {\n throw new Error('You can only call remember on a top level GUI.);\n }\n const _this =\n this;\n common.each(Array.prototype.slice.call(arguments), function(object) {\n if\n (_this.__rememberedObjects.length === 0) {\n addSaveMenu(_this);\n }\n if\n (_this.__rememberedObjects.indexOf(object) === -1) {\n _this.__rememberedObjects.push(object);\n }\n });\n if (this.autoPlace) {\n // Set save row width\n setWidth(this, this.width);\n }\n },\n\n /**\n * @returns {dat.gui.GUI} the topmost parent GUI of a nested GUI.\n * @instance\n */\n getRoot:\n function() {\n let gui = this;\n while (gui.parent) {\n gui = gui.parent;\n }\n return gui;\n },\n\n /**\n * @returns {Object} a JSON object representing the current state of\n * this GUI as well as its\n remembered properties.\n * @instance\n */\n getSaveObject: function() {\n const toReturn = this.load;\n toReturn.closed = this.closed;\n // Am I remembering any values?\n if (this.__rememberedObjects.length >\n 0) {\n toReturn.preset = this.preset;\n if (!toReturn.remembered) {\n toReturn.remembered = {};\n }\n toReturn.remembered[this.preset] = getCurrentPreset(this);\n }\n toReturn.folders = {};\n common.each(this.__folders, function(element, key) {\n toReturn.folders[key] = element.getSaveObject();\n });\n return toReturn;\n },\n\n save: function() {\n if (!this.load.remembered) {\n

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this.load.remembered = {};
    }
    this.load.remembered[this.preset] = getCurrentPreset(this);
    markPresetModified(this, false);
    this.saveToLocalStorageIfPossible();
    },
    saveAs:
function(presetName) {
    if (!this.load.remembered) {
        // Retain default values upon first save
        this.load.remembered = {};
        this.load.remembered[DEFAULT_DEFAULT_PRESET_NAME] =
getCurrentPreset(this, true);
    }
    this.load.remembered[presetName] = getCurrentPreset(this);
    this.preset = presetName;
    addPresetOption(this, presetName, true);
    this.saveToLocalStorageIfPossible();
    },
    revert: function(gui) {
        common.each(this.__controllers, function(controller) {
            // Make revert
            work on Default
            if (!this.getRoot().load.remembered) {
                controller.setValue(controller.initialValue);
            } else {
                recallSavedValue(gui || this.getRoot(), controller);
            }
            // fire onFinishChange
            callback
            if (controller.__onFinishChange) {
                controller.__onFinishChange.call(controller,
                controller.getValue());
            }
        }, this);
        common.each(this.__folders, function(folder) {
            folder.revert(folder);
        });
        if (!gui) {
            markPresetModified(this.getRoot(), false);
        }
    },
    listen: function(controller) {
        const init = this.__listening.length === 0;
        this.__listening.push(controller);
        if (init) {
            updateDisplays(this.__listening);
        }
        updateDisplay: function() {
            common.each(this.__controllers, function(controller) {
                controller.updateDisplay();
            });
            common.each(this.__folders, function(folder) {
                folder.updateDisplay();
            });
        }
    }
};

// Add
a row to the end of the GUI or before another row.
@param gui
@param [newDom] If specified, inserts
the dom content in the new row
@param [liBefore] If specified, places the new row before another row
@param
@ignore
function addRow(gui, newDom, liBefore) {
    const li = document.createElement('li');
    if
(newDom) {
        li.appendChild(newDom);
    }
    if (liBefore) {
        gui.__ul.insertBefore(li, liBefore);
    } else
{
        gui.__ul.appendChild(li);
    }
    gui.onResize();
    return li;
}

function removeListeners(gui) {
    dom.unbind(window, 'resize', gui.__resizeHandler);
    if (gui.saveToLocalStorageIfPossible) {
        dom.unbind(window, 'unload', gui.saveToLocalStorageIfPossible);
    }
}

function markPresetModified(gui,
modified) {
    const opt = gui.__preset_select[gui.__preset_select.selectedIndex];
    if (modified) {
        opt.innerHTML = opt.value + '*';
    } else {
        opt.innerHTML = opt.value;
    }
}

function
augmentController(gui, li, controller) {
    controller.__li = li;
    controller.__gui = gui;
    common.extend(controller, /** @lends Controller.prototype */ {
        /**
         * @param {Array|Object} options
         * @return {Controller}
         */
        options: function(options) {
            if (arguments.length > 1) {
                const
                nextSibling = controller.__li.nextElementSibling;
                controller.remove();
                return add(
                    gui,
                    controller.object,
                    controller.property,
                    {
                        before: nextSibling,
                        factoryArgs:
[common.toArray(arguments)]
                    },
                    );
            }
            if (common.isArray(options) ||
common.isObject(options)) {
                const nextSibling = controller.__li.nextElementSibling;
                controller.remove();
                return add(
                    gui,
                    controller.object,
                    controller.property,
                    {
                        before: nextSibling,
                        factoryArgs: [options]
                    },
                    );
            }
            /**
             * Sets the
            name of the controller.
             * @param {string} name
             * @return {Controller}
             */
            name: function(name)
{
                controller.__li.firstChild.firstChild.innerHTML = name;
                return controller;
            },
            /**
             * Sets controller to listen for changes on its underlying object.
             * @return {Controller}
             */
            listen:
function() {
                controller.__gui.listen(controller);
                return controller;
            },
            /**
             * Removes the
            controller from its parent GUI.
             * @return {Controller}
             */
            remove: function() {
                controller.__gui.remove(controller);
                return controller;
            }
        });
        // All sliders should be accompanied by a
        box.
        if (controller instanceof NumberControllerSlider) {
            const box = new
            NumberControllerBox(controller.object, controller.property,
            {
                min: controller.__min, max: controller.__max,
                step: controller.__step
            });
            common.each(['updateDisplay', 'onChange', 'onFinishChange', 'step', 'min', 'max'],
            function(method) {
                const pc = controller[method];
                const pb = box[method];
                controller[method] =
                box[method] = function() {
                    const args = Array.prototype.slice.call(arguments);
                    pb.apply(box, args);
                    return pc.apply(controller, args);
                };
            });
            dom.addClass(li, 'has-slider');
            controller.domElement.insertBefore(box.domElement, controller.domElement.firstChild);
        } else if
(controller instanceof NumberControllerBox) {
            const r = function(returned) {
                // Have we defined both

```

```

boundaries?\n    if (common.isNumber(controller.__min) && common.isNumber(controller.__max)) {\n        //
Well, then lets just replace this with a slider.\n\n        // lets remember if the old controller had a specific name or
was listening\n        const oldName = controller.__li.firstChild.firstChild.innerHTML;\n        const
wasListening = controller.__gui.__listening.indexOf(controller) > -1;\n\n        controller.remove();\n        const
newController = add(\n            gui,\n            controller.object,\n            controller.property,\n            {\n                before:
controller.__li.nextElementSibling,\n                factoryArgs: [controller.__min, controller.__max, controller.__step]\n
            });\n\n        newController.name(oldName);\n        if (wasListening) newController.listen();\n\n        return
newController;\n    }\n\n    return returned;\n    };\n\n    controller.min = common.compose(r, controller.min);\n
controller.max = common.compose(r, controller.max);\n    } else if (controller instanceof BooleanController) {\n
dom.bind(li, 'click', function() {\n        dom.fakeEvent(controller.__checkbox, 'click');\n    });\n\n
dom.bind(controller.__checkbox, 'click', function(e) {\n        e.stopPropagation(); // Prevents double-toggle\n    });\n
} else if (controller instanceof FunctionController) {\n    dom.bind(li, 'click', function() {\n
dom.fakeEvent(controller.__button, 'click');\n    });\n\n    dom.bind(li, 'mouseover', function() {\n
dom.addClass(controller.__button, 'hover');\n    });\n\n    dom.bind(li, 'mouseout', function() {\n
dom.removeClass(controller.__button, 'hover');\n    });\n    } else if (controller instanceof ColorController) {\n
dom.addClass(li, 'color');\n    controller.updateDisplay = common.compose(function(val) {\n
li.style.borderColor = controller.__color.toString();\n    return val;\n    }, controller.updateDisplay);\n\n
controller.updateDisplay();\n    }\n\n    controller.setValue = common.compose(function(val) {\n    if
(gui.getRoot().__preset_select && controller.isModified()) {\n        markPresetModified(gui.getRoot(), true);\n
    }\n\n    return val;\n    }, controller.setValue);\n    }\n\nfunction recallSavedValue(gui, controller) {\n    // Find the
topmost GUI, that's where remembered objects live.\n    const root = gui.getRoot();\n\n    // Does the object we're
controlling match anything we've been told to\n    // remember?\n    const matchedIndex =
root.__rememberedObjects.indexOf(controller.object);\n\n    // Why yes, it does!\n    if (matchedIndex !== -1) {\n        //
Let me fetch a map of controllers for thcommon.isObject.\n        let controllerMap =
root.__rememberedObjectIndecesToControllers[matchedIndex];\n\n        // Ohp, I believe this is the first controller
we've created for this\n        // object. Lets make the map fresh.\n        if (controllerMap === undefined) {\n
controllerMap = {};\n        root.__rememberedObjectIndecesToControllers[matchedIndex] =\n            controllerMap;\n
        }\n\n        // Keep track of this controller\n        controllerMap[controller.property] = controller;\n\n        // Okay, now have
we saved any values for this controller?\n        if (root.load && root.load.remembered) {\n            const presetMap =
root.load.remembered;\n\n            // Which preset are we trying to load?\n            let preset;\n\n            if
(presetMap[gui.preset]) {\n                preset = presetMap[gui.preset];\n            } else if
(presetMap[DEFAULT_DEFAULT_PRESET_NAME]) {\n                // Uhh, you can have the default instead?\n
                preset = presetMap[DEFAULT_DEFAULT_PRESET_NAME];\n            } else {\n                // Nada.\n                return;\n            }\n\n
            // Did the loaded object remember thcommon.isObject? && Did we remember this particular property?\n            if
(preset[matchedIndex] && preset[matchedIndex][controller.property] !== undefined) {\n                // We did remember
something for this guy ...
                const value = preset[matchedIndex][controller.property];\n\n                // And that's what
it is.\n                controller.initialValue = value;\n                controller.setValue(value);\n            }\n        }\n    }\n\nfunction
add(gui, object, property, params) {\n    if (object[property] === undefined) {\n        throw new Error(`Object
\"${object}\" has no property \"${property}\"`);\n    }\n\n    let controller;\n\n    if (params.color) {\n        controller = new
ColorController(object, property);\n    } else {\n        const factoryArgs = [object,
property].concat(params.factoryArgs);\n        controller = ControllerFactory.apply(gui, factoryArgs);\n    }\n\n    if
(params.before instanceof Controller) {\n        params.before = params.before.__li;\n    }\n\n    recallSavedValue(gui,
controller);\n\n    dom.addClass(controller.domElement, 'c');\n\n    const name = document.createElement('span');\n
dom.addClass(name, 'property-name');\n    name.innerHTML = controller.property;\n\n    const container =
document.createElement('div');\n    container.appendChild(name);\n
container.appendChild(controller.domElement);\n\n    const li = addRow(gui, container, params.before);\n\n
dom.addClass(li, GUI.CLASS_CONTROLLER_ROW);\n    if (controller instanceof ColorController) {\n
dom.addClass(li, 'color');\n    } else {\n        dom.addClass(li, typeof controller.getValue());\n    }\n\n

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augmentController(gui, li, controller);\n\n gui.__controllers.push(controller);\n\n return controller;\n}\n\nfunction
getLocalStorageHash(gui, key) {\n // TODO how does this deal with multiple GUI's?\n return
document.location.href + '?' + key;\n}\n\nfunction addPresetOption(gui, name, setSelected) {\n const opt =
document.createElement('option');\n opt.innerHTML = name;\n opt.value = name;\n
gui.__preset_select.appendChild(opt);\n if (setSelected) {\n gui.__preset_select.selectedIndex =
gui.__preset_select.length - 1;\n }\n}\n\nfunction showHideExplain(gui, explain) {\n explain.style.display =
gui.useLocalStorage ? 'block' : 'none';\n}\n\nfunction addSaveMenu(gui) {\n const div = gui.__save_row =
document.createElement('li');\n\n dom.addClass(gui.domElement, 'has-save');\n\n gui.__ul.insertBefore(div,
gui.__ul.firstChild);\n\n dom.addClass(div, 'save-row');\n\n const gears = document.createElement('span');\n
gears.innerHTML = '&nbsp;';\n dom.addClass(gears, 'button gears');\n\n // TODO replace with
FunctionController\n const button = document.createElement('span');\n button.innerHTML = 'Save';\n
dom.addClass(button, 'button');\n dom.addClass(button, 'save');\n\n const button2 =
document.createElement('span');\n button2.innerHTML = 'New';\n dom.addClass(button2, 'button');\n
dom.addClass(button2, 'save-as');\n\n const button3 = document.createElement('span');\n button3.innerHTML =
'Revert';\n dom.addClass(button3, 'button');\n dom.addClass(button3, 'revert');\n\n const select =
gui.__preset_select = document.createElement('select');\n\n if (gui.load && gui.load.remembered) {\n
common.each(gui.load.remembered, function(value, key) {\n addPresetOption(gui, key, key === gui.preset);\n
});\n } else {\n addPresetOption(gui, DEFAULT_DEFAULT_PRESET_NAME, false);\n }\n\n dom.bind(select,
'change', function() {\n for (let index = 0; index < gui.__preset_select.length; index++) {\n
gui.__preset_select[index].innerHTML = gui.__preset_select[index].value;\n }\n\n gui.preset = this.value;\n
});\n\n div.appendChild(select);\n div.appendChild(gears);\n div.appendChild(button);\n
div.appendChild(button2);\n div.appendChild(button3);\n\n if (SUPPORTS_LOCAL_STORAGE) {\n const
explain = document.getElementById('dg-local-explain');\n const localStorageCheckBox =
document.getElementById('dg-local-storage');\n const saveLocally = document.getElementById('dg-save-
locally');\n\n saveLocally.style.display = 'block';\n\n if (localStorage.getItem(getLocalStorageHash(gui,
'isLocal')) === 'true') {\n localStorageCheckBox.setAttribute('checked', 'checked');\n }\n\n
showHideExplain(gui, explain);\n\n // TODO: Use a boolean controller, fool!\n
dom.bind(localStorageCheckBox, 'change', function() {\n gui.useLocalStorage = !gui.useLocalStorage;\n
showHideExplain(gui, explain);\n });\n }\n\n const newConstructorTextArea = document.getElementById('dg-
new-constructor');\n\n dom.bind(newConstructorTextArea, 'keydown', function(e) {\n if (e.metaKey && (e.which
=== 67 || e.keyCode === 67)) {\n SAVE_DIALOGUE.hide();\n }\n });\n\n dom.bind(gears, 'click', function()
{\n newConstructorTextArea.innerHTML = JSON.stringify(gui.getSaveObject(), undefined, 2);\n
SAVE_DIALOGUE.show();\n newConstructorTextArea.focus();\n newConstructorTextArea.select();\n });\n\n
dom.bind(button, 'click', function() {\n gui.save();\n });\n\n dom.bind(button2, 'click', function() {\n const
presetName = prompt('Enter a new preset name.);\n if (presetName) {\n gui.saveAs(presetName);\n }\n
});\n\n dom.bind(button3, 'click', function() {\n gui.revert();\n });\n\n //
div.appendChild(button2);\n}\n\nfunction addResizeHandle(gui) {\n let pmouseX;\n\n gui.__resize_handle =
document.createElement('div');\n\n common.extend(gui.__resize_handle.style, {\n\n width: '6px',\n marginLeft:
'-3px',\n height: '200px',\n cursor: 'ew-resize',\n position: 'absolute'\n // border: '1px solid blue'\n\n });\n\n
function drag(e) {\n e.preventDefault();\n\n gui.width += pmouseX - e.clientX;\n gui.onResize();\n pmouseX
= e.clientX;\n\n return false;\n }\n\n function dragStop() {\n dom.removeClass(gui.__closeButton,
GUI.CLASS_DRAG);\n dom.unbind(window, 'mousemove', drag);\n dom.unbind(window, 'mouseup',
dragStop);\n }\n\n function dragStart(e) {\n e.preventDefault();\n\n pmouseX = e.clientX;\n\n
dom.addClass(gui.__closeButton, GUI.CLASS_DRAG);\n dom.bind(window, 'mousemove', drag);\n
dom.bind(window, 'mouseup', dragStop);\n\n return false;\n }\n\n dom.bind(gui.__resize_handle, 'mousedown',
dragStart);\n dom.bind(gui.__closeButton, 'mousedown', dragStart);\n\n
gui.domElement.insertBefore(gui.__resize_handle, gui.domElement.firstChild);\n}\n\nfunction
setWidth(gui, w) {\n gui.domElement.style.width = w + 'px';\n // Auto placed save-rows are position fixed, so we

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have to\n // set the width manually if we want it to bleed to the edge\n if (gui.__save_row && gui.autoPlace) {\n\n  gui.__save_row.style.width = w + 'px';\n\n } \n\n if (gui.__closeButton) {\n\n   gui.__closeButton.style.width = w + 'px';\n\n }\n\n\n\nfunction getCurrentPreset(gui, useInitialValues) {\n\n  const toReturn = {};\n\n  // For each object I'm remembering\n  common.each(gui.__rememberedObjects, function(val, index) {\n\n    const savedValues = {};\n\n    // The controllers I've made for thcommon.isObject by property\n    const controllerMap =\n\n      gui.__rememberedObjectIndecesToControllers[index];\n\n    // Remember each value for each property\n    common.each(controllerMap, function(controller, property) {\n\n      savedValues[property] = useInitialValues ?\n\n        controller.initialValue : controller.getValue();\n\n    });\n\n    // Save the values for thcommon.isObject\n    toReturn[index] = savedValues;\n\n  });\n\n  return toReturn;\n\n}\n\n\nfunction setPresetSelectIndex(gui) {\n\n  for (let index = 0; index < gui.__preset_select.length; index++) {\n\n    if (gui.__preset_select[index].value === gui.preset)\n\n    {\n\n      gui.__preset_select.selectedIndex = index;\n\n    }\n\n  }\n\n}\n\n\nfunction updateDisplays(controllerArray) {\n\n  if (controllerArray.length !== 0) {\n\n    requestAnimationFrame.call(window, function()\n\n    {\n\n      updateDisplays(controllerArray);\n\n    });\n\n  }\n\n  common.each(controllerArray, function(c) {\n\n    c.updateDisplay();\n\n  });\n\n}\n\n\nexport default GUI;\n\n", "/// stats.js -\n\nhttp://github.com/mrdoob/stats.js\n\n(function(f,e){\n\n  \"object\"===typeof exports&&\"undefined\"!==typeof\n\n  module?module.exports=e(\\\"function\\\"===typeof define&&define.amd?define(e):f.Stats=e)})(this,function(){\n\n  var\n\n  f=function(){\n\n    function e(a){\n\n      c.appendChild(a.dom);return a\n\n    }\n\n    function u(a){\n\n      for(var\n\n      d=0;d<c.children.length;d++)\n\n      c.children[d].style.display=d===a?\"block\":\"none\";l=a\n\n      var\n\n      l=0,c=document.createElement(\"div\");\n\n      c.style.cssText=\\\"position:fixed;top:0;left:0;cursor:pointer;opacity:0.9;z-index:10000\\\";\n\n      c.addEventListener(\"click\",function(a){\n\n        a.preventDefault();\n\n        nu(+++1%c.children.length),11);\n\n        var\n\n        k=(performance|Date).now(),g=k,a=0,r=e(new f.Panel(\"FPS\",`\"#0ff\",`\"#002`)),h=e(new\n\n        f.Panel(\"MS\",`\"#0f0\",`\"#020`));\n\n        if(self.performance&&self.performance.memory)\n\n        var t=e(new\n\n        f.Panel(\"MB\",`\"#f08\",`\"#201`));\n\n        u(0);return {REVISION:16,dom:c,addPanel:e,showPanel:u,begin:function(){\n\n          k=(performance|Date).now(),\n\n          end:function(){\n\n            a++;var\n\n            c=(performance|Date).now();\n\n            h.update(c-k,200);\n\n            if(c>g+1E3&&(r.update(1E3*a/(c-g),100),g=c,a=0,t))\n\n            {\n\n              var\n\n              d=performance.memory;\n\n              t.update(d.usedJSHeapSize/\\n1048576,d.jsHeapSizeLimit/1048576)}\n\n              return\n\n              c},update:function(){\n\n                k=this.end(),\n\n                domElement:c,\n\n                setMode:u\n\n              }};\n\n              f.Panel=function(e,f,l){\n\n                var\n\n                c=Infinity,k=0,g=Math.round,a=g(window.devicePixelRatio|1),r=80*a,h=48*a,t=3*a,v=2*a,d=3*a,m=15*a,n=74*a\n\n                ,p=30*a,q=document.createElement(\"canvas\");\n\n                q.width=r;q.height=h;q.style.cssText=\\\"width:80px;height:48px\\\";\n\n                var\n\n                b=q.getContext(\"2d\");\n\n                b.font=\\\"bold \"+9*a+\\\"px Helvetica,Arial,sans-serif\\\";\n\n                b.textBaseline=\\\"top\\\";\n\n                b.fillStyle=l;\n\n                b.fillRect(0,0,r,h);\n\n                b.fillStyle=f;\n\n                b.fillText(e,t,v);\n\n                nb.fillRect(d,m,n,p);\n\n                b.fillStyle=l;\n\n                b.globalAlpha=.9;\n\n                b.fillRect(d,m,n,p);return\n\n                {dom:q,update:function(h,w){\n\n                  c=Math.min(c,h);\n\n                  k=Math.max(k,h);\n\n                  b.fillStyle=l;\n\n                  b.globalAlpha=1;\n\n                  b.fillRect(0,0,r,m);\n\n                  b.fillStyle=f;\n\n                  b.fillText(g(h)+\\\" \"+e+\\\" \"+g(c)+\\\"-\\\"+g(k)+\\\"\\\"),t,v);\n\n                  b.drawImage(q,d+a,m,n-a,p,d,m,n-a,p);\n\n                  b.fillRect(d+n-a,m,a,p);\n\n                  b.fillStyle=l;\n\n                  b.globalAlpha=.9;\n\n                  b.fillRect(d+n-a,m,a,g((1-h/w)*p))\n\n                }};\n\n                return\n\n                f;\n\n              };\n\n              /*\n\n              * @license\n\n              * Copyright 2019 Google LLC. All Rights Reserved.\n\n              * Licensed under the Apache License, Version 2.0 (the\n\n              \\\"License\\\");\n\n              * you may not use this file except in compliance with the License.\n\n              * You may obtain a copy of the License at\n\n              * http://www.apache.org/licenses/LICENSE-2.0\n\n              * Unless required by applicable law or agreed to in writing, software\n\n              * distributed under the License is distributed on an\n\n              \\\"AS IS\\\" BASIS,\n\n              * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n\n              * See the License for the specific language governing permissions and\n\n              * limitations under the License.\n\n              *\n\n              =====\n\n              *\n\n              \\nimport*as tf from\\\"@tensorflow/tfjs-core\\\";\n\n              import{util,tidy,div,sub,buffer,Tensor,browser,pad3d,scalar,concat,tensor2d,tensor}from\\\"@tensorflow/tfjs-core\\\";\n\n              import{loadGraphModel}from\\\"@tensorflow/tfjs-converter\\\";var\n\n              VALID_OUTPUT_STRIDES=[8,16,32];function\n\n              assertValidOutputStride(e){util.assert(\\\"number\\\"===typeof\n\n              e,function(){return\n\n              \\\"outputStride is not a number\\\"}),util.assert(VALID_OUTPUT_STRIDES.indexOf(e)>=0,function(){return\n\n              \\\"outputStride of\n\n              \\\"+e+\\\" is
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invalid. It must be either 8, 16, or 32"))}function assertValidResolution(e,t){util.assert("number"===typeof
e,function(){return"resolution is not a number"}),util.assert((e-1)%t===0,function(){return"resolution of \""+e+"\" is
invalid for output stride \"+t+\".\"")}}function toFloatIfInt(e){return
tidy(function(){return"int32"===e.dtype&&(e=e.toFloat()),e=div(e,127.5),sub(e,1)}})var
MobileNet=function(){function e(e,t){this.model=e;var r=this.model.inputs[0].shape;util.assert(-1===r[1]&&-
1===r[2],function(){return"Input shape [\"+r[1]+\", \"+r[2]+\" must both be -1\"}),this.outputStride=t}return
e.prototype.predict=function(e){var t=this;return tidy(function(){var
r=toFloatIfInt(e).expandDims(0),n=t.model.predict(r),o=n[0],i=n[1],s=n[2],a=n[3];return{heatmapScores:i.squeeze(
).sigmoid(),offsets:o.squeeze(),displacementFwd:s.squeeze(),displacementBwd:a.squeeze()}}),e.prototype.dispose
=function(){this.model.dispose(),e()};function half(e){return Math.floor(e/2)}var MaxHeap=function(){function
e(e,t){this.priorityQueue=new Array(e),this.numberOfElements=-1,this.getElementValue=t}return
e.prototype.enqueue=function(e){this.priorityQueue[++this.numberOfElements]=e,this.swim(this.numberOfElemen
ts)},e.prototype.dequeue=function(){var e=this.priorityQueue[0];return this.exchange(0,this.numberOfElements--
),this.sink(0),this.priorityQueue[this.numberOfElements+1]=null,e},e.prototype.empty=function(){return-
1===this.numberOfElements},e.prototype.size=function(){return
this.numberOfElements+1},e.prototype.all=function(){return
this.priorityQueue.slice(0,this.numberOfElements+1)},e.prototype.max=function(){return
this.priorityQueue[0]},e.prototype.swim=function(e){for(;e>0&&this.less(half(e),e);)this.exchange(e,half(e)),e=half
(e)},e.prototype.sink=function(e){for(;2*e<=this.numberOfElements;){var
t=2*e;if(t<this.numberOfElements&&this.less(t,t+1)&&t++,!this.less(e,t))break;this.exchange(e,t),e=t}},e.prototype
.getValueAt=function(e){return this.getElementValue(this.priorityQueue[e])},e.prototype.less=function(e,t){return
this.getValueAt(e)<this.getValueAt(t)},e.prototype.exchange=function(e,t){var
r=this.priorityQueue[e];this.priorityQueue[e]=this.priorityQueue[t],this.priorityQueue[t]=r,e()};function
scoreIsMaximumInLocalWindow(e,t,r,n,o,i){for(var s=i.shape,a=s[0],u=s[1],l=!0,f=Math.max(r-
o,0),c=Math.min(r+o+1,a),d=f;d<c;++d){for(var p=Math.max(n-
o,0),h=Math.min(n+o+1,u),m=p;m<h;++m)if(i.get(d,m,e)>t){l=!1;break}if(!l)break}return l}function
buildPartWithScoreQueue(e,t,r){for(var n=r.shape,o=n[0],i=n[1],s=n[2],a=new MaxHeap(o*i*s,function(e){return
e.score}),u=0;u<o;++u)for(var l=0;l<i;++l)for(var f=0;f<s;++f){var
c=r.get(u,l,f);c<e||scoreIsMaximumInLocalWindow(f,c,u,l,t,r)&&a.enqueue({score:c,part:{heatmapY:u,heatmapX:l,
id:f}})}return a}var
partNames=["nose","leftEye","rightEye","leftEar","rightEar","leftShoulder","rightShoulder","leftElbow",
"rightElbow","leftWrist","rightWrist","leftHip","rightHip","leftKnee","rightKnee","leftAnkle","rightAn
kle"],NUM_KEYPOINTS=partNames.length,partIds=partNames.reduce(function(e,t,r){return
e[t]=r,e},{}),connectedPartNames=[["leftHip","leftShoulder"],["leftElbow","leftShoulder"],["leftElbow","lef
tWrist"],["leftHip","leftKnee"],["leftKnee","leftAnkle"],["rightHip","rightShoulder"],["rightElbow","right
Shoulder"],["rightElbow","rightWrist"],["rightHip","rightKnee"],["rightKnee","rightAnkle"],["leftShould
er","rightShoulder"],["leftHip","rightHip"]],poseChain=[["nose","leftEye"],["leftEye","leftEar"],["nose",
"rightEye"],["rightEye","rightEar"],["nose","leftShoulder"],["leftShoulder","leftElbow"],["leftElbow","lef
tWrist"],["leftShoulder","leftHip"],["leftHip","leftKnee"],["leftKnee","leftAnkle"],["nose","rightShould
er"],["rightShoulder","rightElbow"],["rightElbow","rightWrist"],["rightShoulder","rightHip"],["rightHip",
"rightKnee"],["rightKnee","rightAnkle"]],connectedPartIndices=connectedPartNames.map(function(e){var
t=e[0],r=e[1];return[partIds[t],partIds[r]]}),partChannels=["left_face","right_face","right_upper_leg_front","rig
ht_lower_leg_back","right_upper_leg_back","left_lower_leg_front","left_upper_leg_front","left_upper_leg_ba
ck","left_lower_leg_back","right_feet","right_lower_leg_front","left_feet","torso_front","torso_back","rig
ht_upper_arm_front","right_upper_arm_back","right_lower_arm_back","left_lower_arm_front","left_upper_ar
m_front","left_upper_arm_back","left_lower_arm_back","right_hand","right_lower_arm_front","left_hand"];
function getOffsetPoint(e,t,r,n){return{y:n.get(e,t,r),x:n.get(e,t,r+NUM_KEYPOINTS)}}function
getImageCoords(e,t,r){var

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n=getOffsetPoint(e.heatmapY,e.heatmapX,e.id,r),o=n.y,i=n.x;return{x:e.heatmapX*t+i,y:e.heatmapY*t+o}}function
n clamp(e,t,r){return e<t?t:e>r?r:e}function squaredDistance(e,t,r,n){var o=r-e,i=n-t;return o*o+i*i}function
addVectors(e,t){return{x:e.x+t.x,y:e.y+t.y}}var parentChildrenTuples=poseChain.map(function(e){var
t=e[0],r=e[1];return[partIds[t],partIds[r]]}),parentToChildEdges=parentChildrenTuples.map(function(e){return
e[1]}),childToParentEdges=parentChildrenTuples.map(function(e){return e[0]});function
getDisplacement(e,t,r){var n=r.shape[2]/2;return{y:r.get(t.y,t.x,e),x:r.get(t.y,t.x,n+e)}}function
getStridedIndexNearPoint(e,t,r,n){return{y:clamp(Math.round(e.y/t),0,r-1),x:clamp(Math.round(e.x/t),0,n-
1)}}function traverseToTargetKeypoint(e,t,r,n,o,i,s,a){void 0===a&&(a=2);for(var
u=n.shape,l=u[0],f=u[1],c=getDisplacement(e,getStridedIndexNearPoint(t.position,i,l,f),s),d=addVectors(t.position,c
),p=0;p<a;p++){var
h=getStridedIndexNearPoint(d,i,l,f),m=getOffsetPoint(h.y,h.x,r,o);d=addVectors({x:h.x*i,y:h.y*i},{x:m.x,y:m.y})}
var g=getStridedIndexNearPoint(d,i,l,f),_=n.get(g.y,g.x,r);return{position:d,part:partNames[r],score:_}}function
decodePose(e,t,r,n,o,i){var s=t.shape[2],a=parentToChildEdges.length,u=new
Array(s),l=e.part,f=e.score,c=getImageCoords(l,n,r);u[l.id]={score:f,part:partNames[l.id],position:c};for(var d=a-
1;d>=0;--d){var
p=parentToChildEdges[d],h=childToParentEdges[d];u[p]&&!u[h]&&(u[h]=traverseToTargetKeypoint(d,u[p],h,t,r,n
,i))}for(d=0;d<a;++d){p=childToParentEdges[d],h=parentToChildEdges[d];u[p]&&!u[h]&&(u[h]=traverseToTarge
tKeypoint(d,u[p],h,t,r,n,o))}return u}function withinNmsRadiusOfCorrespondingPoint(e,t,r,n){var o=r.x,i=r.y;return
e.some(function(e){var r=e.keypoints[n].position;return squaredDistance(i,o,r.y,r.x)<=t})}function
getInstanceScore(e,t,r){return r.reduce(function(r,n,o){var i=n.position,s=n.score;return
withinNmsRadiusOfCorrespondingPoint(e,t,i,o)||r+=s,r},0)/r.length}var kLocalMaximumRadius=1;function
decodeMultiplePoses(e,t,r,n,o,i,s,a){void 0===s&&(s=.5),void 0===a&&(a=20);for(var
u=[],l=buildPartWithScoreQueue(s,kLocalMaximumRadius,e),f=a*a;u.length<i&&!l.empty();){var
c=l.dequeue();if(!withinNmsRadiusOfCorrespondingPoint(u,f,getImageCoords(c.part,o,t),c.part.id)){var
d=decodePose(c,e,t,o,r,n),p=getInstanceScore(u,f,d);u.push({keypoints:d,score:p})}return u}var
__assign=function(){return(__assign=Object.assign||function(e){for(var t,r=1,n=arguments.length;r<n;r++)for(var o
in t=arguments[r])Object.prototype.hasOwnProperty.call(t,o)&&(e[o]=t[o]);return
e}).apply(this,arguments)};function __awaiter(e,t,r,n){return new(r||(r=Promise))(function(o,i){function
s(e){try{u(n.next(e))}catch(e){i(e)}}function a(e){try{u(n.throw(e))}catch(e){i(e)}}function
u(e){e.done?o(e.value):new r(function(t){t(e.value)}).then(s,a)}u((n=n.apply(e,t||[])).next())})}function
__generator(e,t){var r,n,o,i,s={label:0,sent:function(){if(1&o[0])throw o[1];return o[1]},trys:[],ops:[]};return
i={next:a(0),throw:a(1),return:a(2)},"function"==typeof Symbol&&(i[Symbol.iterator]=function(){return
this}),i;function a(i){return function(a){return function(i){if(r)throw new TypeError("Generator is already
executing.");for(;s;try{if(r=1,n&&(o=2&i[0]?n.return:i[0]?n.throw||((o=n.return)&&o.call(n,0):n.next)&&!o=o.c
all(n,i[1])).done)return o;switch(n=0,o&&(i=[2&i[0],o.value]),i[0]){case 0:case 1:o=i;break;case 4:return
s.label++,{value:i[1],done:!1};case 5:s.label++,n=i[1],i=[0];continue;case
7:i=s.ops.pop(),s.trys.pop();continue;default:if(!(o=(o=s.trys).length>0&&o[o.length-
1])&&(6===i[0]||2===i[0])){s=0;continue}if(3===i[0]&&(!o||i[1]>o[0]&&i[1]<o[3])){s.label=i[1];break}if(6===i[
0]&&s.label<o[1]){s.label=o[1],o=i;break}if(o&&s.label<o[2]){s.label=o[2],s.ops.push(i);break}o[2]&&s.ops.pop(
),s.trys.pop();continue}i=t.call(e,s)}catch(e){i=[6,e],n=0}finally{r=o=0}if(5&i[0])throw
i[1];return{value:i[0]?i[1]:void 0,done:!0}}([i,a])}}function eitherPointDoesntMeetConfidence(e,t,r){return
e<r||t<r}function getAdjacentKeyPoints(e,t){return connectedPartIndices.reduce(function(r,n){var
o=n[0],i=n[1];return eitherPointDoesntMeetConfidence(e[o].score,e[i].score,t)?r:(r.push([e[o],e[i]]),r),[])}var
NEGATIVE_INFINITY=Number.NEGATIVE_INFINITY,POSITIVE_INFINITY=Number.POSITIVE_INFINITY
;function getBoundingBox(e){return e.reduce(function(e,t){var
r=e.maxX,n=e.maxY,o=e.minX,i=e.minY,s=t.position,a=s.x,u=s.y;return{maxX:Math.max(r,a),maxY:Math.max(n,
u),minX:Math.min(o,a),minY:Math.min(i,u)},{maxX:NEGATIVE_INFINITY,maxY:NEGATIVE_INFINITY,min
X:POSITIVE_INFINITY,minY:POSITIVE_INFINITY}})function getBoundingBoxPoints(e){var

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t=getBoundingBox(e),r=t.minX,n=t.minY,o=t.maxX,i=t.maxY;return[{x:r,y:n},{x:o,y:n},{x:o,y:i},{x:r,y:i}]}function
toTensorBuffer(e,t){return void 0===t&&(t="float32"),__awaiter(this,void 0,void 0,function(){var r;return
__generator(this,function(n){switch(n.label){case 0:return[4,e.data()];case 1:return
r=n.sent(),[2,buffer(e.shape,t,r)]}})}function toTensorBuffers3D(e){return __awaiter(this,void 0,void
0,function(){return __generator(this,function(t){return[2,Promise.all(e.map(function(e){return
toTensorBuffer(e,"float32")})])]}))}function scalePose(e,t,r,n,o){return void 0===n&&(n=0),void
0===o&&(o=0),{score:e.score,keypoints:e.keypoints.map(function(e){var
i=e.score,s=e.part,a=e.position;return{score:i,part:s,position:{x:a.x*r+o,y:a.y*t+n}}}})}function
scalePoses(e,t,r,n,o){return void 0===n&&(n=0),void
0===o&&(o=0),1===r&&1===t&&0===n&&0===o?e.map(function(e){return scalePose(e,t,r,n,o)})}function
flipPoseHorizontal(e,t){return{score:e.score,keypoints:e.keypoints.map(function(e){var
r=e.score,n=e.part,o=e.position;return{score:r,part:n,position:{x:t-1-o.x,y:o.y}}}})}function
flipPosesHorizontal(e,t){return t<=0?e.map(function(e){return flipPoseHorizontal(e,t)})}function
getInputTensorDimensions(e){return e instanceof Tensor?[e.shape[0],e.shape[1]],[e.height,e.width]}function
toInputTensor(e){return e instanceof Tensor?e.browser.fromPixels(e)}function padAndResizeTo(e,t){var
r=t[0],n=t[1],o=getInputTensorDimensions(e),i=o[0],s=o[1],a=n/r,u=[0,0,0,0],l=u[0],f=u[1],c=u[2],d=u[3];return
s/i<a?(l=0,f=0,c=Math.round(.5*(a*i-s)),d=Math.round(.5*(a*i-s)):(l=Math.round(.5*(1/a*s-
i)),f=Math.round(.5*(1/a*s-i)),c=0,d=0),{resized:tidy(function(){var
t=toInputTensor(e);return(t=pad3d(t,[l,f],[c,d],[0,0])).resizeBilinear([r,n])}),padding:{top:l,left:c,right:d,bottom:f}
}}function scaleAndFlipPoses(e,t,r,n,o){var
i=t[0],s=t[1],a=r[0],u=r[1],l=scalePoses(e,(i+n.top+n.bottom)/a,(s+n.left+n.right)/u,-n.top,-n.left);return
o?flipPosesHorizontal(l,s):l}function mod(e,t){return tidy(function(){var r=e.div(scalar(t,"int32"));return
e.sub(r.mul(scalar(t,"int32")))}function argmax2d(e){var t=e.shape,r=t[0],n=t[1],o=t[2];return
tidy(function(){var
t=e.reshape([r*n,o]).argMax(0),i=t.div(scalar(n,"int32")).expandDims(1),s=mod(t,n).expandDims(1);return
concat([i,s,1])}function getPointsConfidence(e,t){for(var r=t.shape[0],n=new Float32Array(r),o=0;o<r;o++){var
i=t.get(o,0),s=t.get(o,1);n[o]=e.get(i,s,o)}return n}function
getOffsetPoint$(e,t,r,n){return {y:n.get(e,t,r),x:n.get(e,t,r+NUM_KEYPOINTS)}function
getOffsetVectors(e,t){for(var r=[],n=0;n<NUM_KEYPOINTS;n++){var
o=getOffsetPoint$(e.get(n,0).valueOf(),e.get(n,1).valueOf(),n,t),i=o.x,s=o.y;r.push(s),r.push(i)}return
tensor2d(r,[NUM_KEYPOINTS,2])}function getOffsetPoints(e,t,r){return tidy(function(){var
n=getOffsetVectors(e,r);return e.toTensor().mul(scalar(t,"int32")).toFloat().add(n)}function
decodeSinglePose(e,t,r){return __awaiter(this,void 0,void 0,function(){var n,o,i,s,a,u,l,f,c,d;return
__generator(this,function(p){switch(p.label){case 0:return
n=0,o=argmax2d(e),[4,Promise.all([toTensorBuffer(e),toTensorBuffer(t),toTensorBuffer(o,"int32")]);case
1:return i=p.sent(),s=i[0],a=i[1],u=i[2],[4,toTensorBuffer(l=getOffsetPoints(u,r,a));case 2:return
f=p.sent(),c=Array.from(getPointsConfidence(s,u)),d=c.map(function(e,t){return
n+=e,{position:{y:f.get(t,0),x:f.get(t,1)},part:partNames[t],score:e}),o.dispose(),l.dispose(),[2,{keypoints:d,score:n
/d.length}]}))}var MOBILENET_BASE_URL="https://storage.googleapis.com/tfjs-
models/savedmodel/posenet/mobilenet/",RESNET50_BASE_URL="https://storage.googleapis.com/tfjs-
models/savedmodel/posenet/resnet50/";function resNet50Checkpoint(e,t){var r="model-stride"+e+"}.json";return
4===t?RESNET50_BASE_URL+"float"+r:RESNET50_BASE_URL+"quant"+t+"^"+r}function
mobileNetCheckpoint(e,t,r){var n={1:"100",.75:"075",.5:"050"},o="model-stride"+e+"}.json";return
4===r?MOBILENET_BASE_URL+"float"+n[t]+"^"+o:MOBILENET_BASE_URL+"quant"+r+"^"+n[t]+"^"+
o}function toFloatIfInt$(e){return tidy(function(){return e.dtype&&(e=e.toFloat());var t=tensor([-123.15,-
115.9,-103.06]);return e.add(t)}var ResNet=function(){function e(e,t){this.model=e;var
r=this.model.inputs[0].shape;util.assert(-1===r[1]&&-1===r[2],function(){return"Input shape ["+r[1]+",
"+r[2]+"] must both be equal to or -1"}),this.outputStride=t}return e.prototype.predict=function(e){var

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t=this;return tidy(function(){ var
r=toFloatToInt$(e).expandDims(0),n=t.model.predict(r),o=n[0],i=n[1],s=n[2];return { heatmapScores:n[3].squeeze().
sigmoid(),offsets:s.squeeze(),displacementFwd:o.squeeze(),displacementBwd:i.squeeze() } },e.prototype.dispose=f
unction(){ this.model.dispose();e},MOBILENET_V1_CONFIG={ architecture:"MobileNetV1",outputStride:16,
multiplier:.75,inputResolution:257},VALID_ARCHITECTURE=["MobileNetV1","ResNet50"],VALID_STRID
E={ MobileNetV1:[8,16,32],ResNet50:[32,16]},VALID_INPUT_RESOLUTION=[161,193,257,289,321,353,385,41
7,449,481,513,801],VALID_MULTIPLIER={ MobileNetV1:[.5,.75,1],ResNet50:[1]},VALID_QUANT_BYTES=[1
,2,4];function
validateModelConfig(e){ if(null==(e=e||MOBILENET_V1_CONFIG).architecture&&(e.architecture="MobileNetV
1"),VALID_ARCHITECTURE.indexOf(e.architecture)<0)throw new Error("Invalid architecture
"+e.architecture+". Should be one of
"+VALID_ARCHITECTURE);if(null==(e=e.inputResolution&&(e.inputResolution=257),VALID_INPUT_RESOLU
TION.indexOf(e.inputResolution)<0)throw new Error("Invalid inputResolution "+e.inputResolution+". Should be
one of
"+VALID_INPUT_RESOLUTION);if(null==(e=e.outputStride&&(e.outputStride=16),VALID_STRIDE[e.architectur
e].indexOf(e.outputStride)<0)throw new Error("Invalid outputStride "+e.outputStride+". Should be one of
"+VALID_STRIDE[e.architecture]+") for architectre
"+e.architecture+".");if(null==(e=e.multiplier&&(e.multiplier=1),VALID_MULTIPLIER[e.architecture].indexOf(e.
multiplier)<0)throw new Error("Invalid multiplier "+e.multiplier+". Should be one of
"+VALID_MULTIPLIER[e.architecture]+") for architectre
"+e.architecture+".");if(null==(e=e.quantBytes&&(e.quantBytes=4),VALID_QUANT_BYTES.indexOf(e.quantByte
s)<0)throw new Error("Invalid quantBytes "+e.quantBytes+". Should be one of "+VALID_QUANT_BYTES+"
for architectre "+e.architecture+".");return e}var
SINGLE_PERSON_INFERENCE_CONFIG={ flipHorizontal:!1},MULTI_PERSON_INFERENCE_CONFIG={ fli
pHorizontal:!1,maxDetections:5,scoreThreshold:.5,nmsRadius:20};function validateMultiPersonInputConfig(e){ var
t=e.maxDetections,r=e.scoreThreshold,n=e.nmsRadius;if(t<=0)throw new Error("Invalid maxDetections "+t+"".
Should be > 0");if(r<0||r>1)throw new Error("Invalid scoreThreshold "+r+"". Should be in range [0.0,
1.0]);if(n<=0)throw new Error("Invalid nmsRadius "+n+"".)}var PoseNet=function(){ function
e(e,t){ this.baseModel=e,this.inputResolution=t}return e.prototype.estimateMultiplePoses=function(e,t){ return void
0===t&&(t=MULTI_PERSON_INFERENCE_CONFIG),__awaiter(this,void 0,void 0,function(){ var
r,n,o,i,s,a,u,l,f,c,d,p,h,m,g,_I,E,v,N,y;return __generator(this,function(T){ switch(T.label){ case 0:return
r=__assign({},MULTI_PERSON_INFERENCE_CONFIG,t),validateMultiPersonInputConfig(t),n=this.baseModel.
outputStride,o=this.inputResolution,assertValidOutputStride(n),assertValidResolution(this.inputResolution,n),i=getI
nputTensorDimensions(e),s=i[0],a=i[1],u=padAndResizeTo(e,[o,o]),l=u.resized,f=u.padding,c=this.baseModel.predi
ct(l),d=c.heatmapScores,p=c.offsets,h=c.displacementFwd,m=c.displacementBwd,[4,toTensorBuffers3D([d,p,h,m])]
);case 1:return
g=T.sent(),_=g[0],I=g[1],E=g[2],v=g[3],[4,decodeMultiplePoses(_I,E,v,n,r.maxDetections,r.scoreThreshold,r.nmsR
adius)];case 2:return
N=T.sent(),y=scaleAndFlipPoses(N,[s,a],[o,o],f,r.flipHorizontal),d.dispose(),p.dispose(),h.dispose(),m.dispose(),l.di
spose(),[2,y] } } } },e.prototype.estimateSinglePose=function(e,t){ return void
0===t&&(t=SINGLE_PERSON_INFERENCE_CONFIG),__awaiter(this,void 0,void 0,function(){ var
r,n,o,i,s,a,u,l,f,c,d,p,h,m,g,_;return __generator(this,function(I){ switch(I.label){ case 0:return
r=__assign({},SINGLE_PERSON_INFERENCE_CONFIG,t),n=this.baseModel.outputStride,o=this.inputResolutio
n,assertValidOutputStride(n),assertValidResolution(o,n),i=getInputTensorDimensions(e),s=i[0],a=i[1],u=padAndRe
sizeTo(e,[o,o]),l=u.resized,f=u.padding,c=this.baseModel.predict(l),d=c.heatmapScores,p=c.offsets,h=c.displacemen
tFwd,m=c.displacementBwd,[4,decodeSinglePose(d,p,n)];case 1:return
g=I.sent(),_=scaleAndFlipPoses([g],[s,a],[o,o],f,r.flipHorizontal),d.dispose(),p.dispose(),h.dispose(),m.dispose(),l.di
spose(),[2,_[0]] } } } },e.prototype.estimatePoses=function(e,t){ return __awaiter(this,void 0,void 0,function(){ return

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__generator(this,function(r){switch(r.label){case 0:return"single-
person"!=t.decodingMethod?[3,2]:[4,this.estimateSinglePose(e,t)];case 1:return[2,[r.sent()]];case
2:return[2,this.estimateMultiplePoses(e,t)]}})},e.prototype.dispose=function(){this.baseModel.dispose(),e()};fun
ction loadMobileNet(e){return __awaiter(this,void 0,void 0,function(){var t,r,n,o,i,s;return
__generator(this,function(a){switch(a.label){case
0;if(t=e.outputStride,r=e.quantBytes,n=e.multiplier,null==tf)throw new Error("Cannot find TensorFlow.js. If you
are using a <script> tag, please also include @tensorflow/tfjs on the page before using this\n    model.");return
o=mobileNetCheckpoint(t,n,r),[4,loadGraphModel(e.modelUrl||o)];case 1:return i=a.sent(),s=new
MobileNet(i,t),[2,new PoseNet(s,e.inputResolution)]}})}function loadResNet(e){return __awaiter(this,void 0,void
0,function(){var t,r,n,o,i;return __generator(this,function(s){switch(s.label){case
0;if(t=e.outputStride,r=e.quantBytes,null==tf)throw new Error("Cannot find TensorFlow.js. If you are using a
<script> tag, please also include @tensorflow/tfjs on the page before using this\n    model.");return
n=resNet50Checkpoint(t,r),[4,loadGraphModel(e.modelUrl||n)];case 1:return o=s.sent(),i=new ResNet(o,t),[2,new
PoseNet(i,e.inputResolution)]}})}function load(e){return void
0===e&&(e=MOBILENET_V1_CONFIG),__awaiter(this,void 0,void 0,function(){return
__generator(this,function(t){return"ResNet50"===e.validateModelConfig(e).architecture?[2,loadResNet(e):"M
obileNetV1"===e.architecture?[2,loadMobileNet(e):[2,null]]})}export{decodeMultiplePoses,decodeSinglePose,
MobileNet,partChannels,partIds,partNames,poseChain,load,PoseNet,VALID_INPUT_RESOLUTION,getAdjacent
KeyPoints,getBoundingBox,getBoundingBoxPoints,scalePose};\n","/*\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport * as posenet from '@tensorflow-models/posenet';\nimport * as tf from '@tensorflow/tfjs-core';\n\nconst
COLOR = 'aqua';\nconst BOUNDING_BOX_COLOR = 'red';\nconst LINE_WIDTH = 2;\n\nexport const
TRY_RESNET_BUTTON_NAME = 'tryResNetButton';\nexport const TRY_RESNET_BUTTON_TEXT = '[New]
Try ResNet50';\nconst TRY_RESNET_BUTTON_TEXT_CSS = 'width:100%;text-decoration:underline;'\nconst
TRY_RESNET_BUTTON_BACKGROUND_CSS = 'background:#e61d5f;'\n\nfunction isAndroid() {\n return
/Android/i.test(navigator.userAgent);\n}\n\nfunction isiOS() {\n return
/iPhone/iPad/iPod/i.test(navigator.userAgent);\n}\n\nexport function isMobile() {\n return isAndroid() ||
isiOS();\n}\n\nfunction setDatGuiPropertyCss(propertyText, liCssString, spanCssString = "") {\n var spans =
document.getElementsByClassName('property-name');\n for (var i = 0; i < spans.length; i++) {\n var text =
spans[i].textContent || spans[i].innerText;\n if (text == propertyText) {\n spans[i].parentNode.parentNode.style
= liCssString;\n if (spanCssString != "") {\n spans[i].style = spanCssString;\n } }\n }\n}\n\nexport
function updateTryResNetButtonDatGuiCss() {\n setDatGuiPropertyCss(\n TRY_RESNET_BUTTON_TEXT,
TRY_RESNET_BUTTON_BACKGROUND_CSS,\n TRY_RESNET_BUTTON_TEXT_CSS);\n}\n\n/*\n *
Toggles between the loading UI and the main canvas UI.\n *\nexport function toggleLoadingUI(\n
showLoadingUI, loadingDivId = 'loading', mainDivId = 'main') {\n if (showLoadingUI) {\n
document.getElementById(loadingDivId).style.display = 'block';\n
document.getElementById(mainDivId).style.display = 'none';\n } else {\n
document.getElementById(loadingDivId).style.display = 'none';\n
document.getElementById(mainDivId).style.display = 'block';\n }\n}\n\nexport function drawPoint(ctx, y, x, r,
color) {\n ctx.beginPath();\n ctx.arc(x, y, r, 0, 2 * Math.PI);\n ctx.fillStyle = color;\n ctx.fill();\n}\n\n/*\n *
Draws a line on a canvas, i.e. a joint\n *\nexport function drawSegment([ay, ax], [by, bx], color, scale, ctx) {\n
ctx.beginPath();\n ctx.moveTo(ax * scale, ay * scale);\n ctx.lineTo(bx * scale, by * scale);\n ctx.lineWidth =

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LINE_WIDTH;\n ctx.strokeStyle = color;\n ctx.stroke();\n}\n\n/**\n * Draws a pose skeleton by looking up all
adjacent keypoints/joints\n */\nexport function drawSkeleton(keypoints, minConfidence, ctx, scale = 1) {\n const
adjacentKeyPoints =\n   posenet.getAdjacentKeyPoints(keypoints, minConfidence);\n\n function toTuple({y, x})
{\n   return [y, x];\n }\n\n adjacentKeyPoints.forEach((keypoints) => {\n   drawSegment(\n
toTuple(keypoints[0].position), toTuple(keypoints[1].position), COLOR,\n     scale, ctx);\n });\n}\n\n/**\n *
Draw pose keypoints onto a canvas\n */\nexport function drawKeypoints(keypoints, minConfidence, ctx, scale = 1)
{\n for (let i = 0; i < keypoints.length; i++) {\n   const keypoint = keypoints[i];\n\n   if (keypoint.score <
minConfidence) {\n     continue;\n   }\n\n   const {y, x} = keypoint.position;\n   drawPoint(ctx, y * scale, x *
scale, 3, COLOR);\n }\n}\n\n/**\n * Draw the bounding box of a pose. For example, for a whole person standing\n
* in an image, the bounding box will begin at the nose and extend to one of\n * ankles\n */\nexport function
drawBoundingBox(keypoints, ctx) {\n const boundingBox = posenet.getBoundingBox(keypoints);\n\n ctx.rect(\n
  boundingBox.minX, boundingBox.minY, boundingBox.maxX - boundingBox.minX,\n  boundingBox.maxY -
boundingBox.minY);\n\n ctx.strokeStyle = boundingBoxColor;\n ctx.stroke();\n}\n\n/**\n * Converts an array of
pixel data into an ImageData object\n */\nexport async function renderToCanvas(a, ctx) {\n const [height, width] =
a.shape;\n const imageData = new ImageData(width, height);\n\n const data = await a.data();\n\n for (let i = 0; i <
height * width; ++i) {\n   const j = i * 4;\n   const k = i * 3;\n\n   imageData.data[j + 0] = data[k + 0];\n
imageData.data[j + 1] = data[k + 1];\n   imageData.data[j + 2] = data[k + 2];\n   imageData.data[j + 3] = 255;\n
}\n\n ctx.putImageData(imageData, 0, 0);\n}\n\n/**\n * Draw an image on a canvas\n */\nexport function
renderImageToCanvas(image, size, canvas) {\n canvas.width = size[0];\n canvas.height = size[1];\n const ctx =
canvas.getContext('2d');\n\n ctx.drawImage(image, 0, 0);\n}\n\n/**\n * Draw heatmap values, one of the model
outputs, on to the canvas\n * Read our blog post for a description of PoseNet's heatmap outputs\n *
https://medium.com/tensorflow/real-time-human-pose-estimation-in-the-browser-with-tensorflow-js-7dd0bc881cd5\n
*/\nexport function drawHeatMapValues(heatMapValues, outputStride, canvas) {\n const ctx =
canvas.getContext('2d');\n const radius = 5;\n const scaledValues = heatMapValues.mul(tf.scalar(outputStride,
'int32'));\n\n drawPoints(ctx, scaledValues, radius, COLOR);\n}\n\n/**\n * Used by the drawHeatMapValues
method to draw heatmap points on to\n * the canvas\n */\nfunction drawPoints(ctx, points, radius, color) {\n const
data = points.buffer().values;\n\n for (let i = 0; i < data.length; i += 2) {\n   const pointY = data[i];\n   const pointX
= data[i + 1];\n\n   if (pointX !== 0 && pointY !== 0) {\n     ctx.beginPath();\n     ctx.arc(pointX, pointY, radius,
0, 2 * Math.PI);\n     ctx.fillStyle = color;\n     ctx.fill();\n   }\n }\n}\n\n/**\n * Draw offset vector values, one of
the model outputs, on to the canvas\n * Read our blog post for a description of PoseNet's offset vector outputs\n *
https://medium.com/tensorflow/real-time-human-pose-estimation-in-the-browser-with-tensorflow-js-7dd0bc881cd5\n
*/\nexport function drawOffsetVectors(\n   heatMapValues, offsets, outputStride, scale = 1, ctx)
{\n const offsetPoints =\n   posenet.singlePose.getOffsetPoints(heatMapValues, outputStride, offsets);\n\n const
heatmapData = heatMapValues.buffer().values;\n const offsetPointsData = offsetPoints.buffer().values;\n\n for (let
i = 0; i < heatmapData.length; i += 2) {\n   const heatmapY = heatmapData[i] * outputStride;\n   const heatmapX =
heatmapData[i + 1] * outputStride;\n   const offsetPointY = offsetPointsData[i];\n   const offsetPointX =
offsetPointsData[i + 1];\n\n   drawSegment(\n     [heatmapY, heatmapX], [offsetPointY, offsetPointX], COLOR,
scale, ctx);\n }\n}\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * https://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

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color schemes generated using d3-scale-chromatic:\n// https://github.com/d3/d3-scale-chromatic\n\nexport const
rainbow = [\n [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255,
94, 99], [255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n [175, 240, 91], [135, 245,

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87], [96, 247, 96], [64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195]\n];\n\nexport const warm = [\n [110, 64, 170], [106, 72, 183], [100, 81, 196], [92, 91, 206],\n [84, 101, 214], [75, 113, 221], [66, 125, 224], [56, 138, 226],\n [48, 150, 224], [40, 163, 220], [33, 176, 214], [29, 188, 205],\n [26, 199, 194], [26, 210, 182], [28, 219, 169], [33, 227, 155],\n [41, 234, 141], [51, 240, 128], [64, 243, 116], [79, 246, 105],\n [96, 247, 97], [115, 246, 91], [134, 245, 88], [155, 243, 88]\n];\n\nexport const spectral = [\n [158, 1, 66], [181, 26, 71], [202, 50, 74], [219, 73, 74],\n [232, 94, 73], [242, 117, 75], [248, 142, 83], [251, 167, 96],\n [253, 190, 112], [254, 210, 129], [254, 227, 149], [254, 240, 166],\n [251, 248, 176], [243, 249, 172], [231, 245, 163], [213, 238, 159],\n [190, 229, 160], [164, 218, 163], [137, 207, 165], [110, 192, 168],\n [86, 173, 174], [70, 150, 179], [67, 127, 180], [77, 103, 173]\n];\n";\n\n/*\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * https://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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=====\n\nimport '@tensorflow/tfjs-backend-webgl';\nimport * as bodyPix from '@tensorflow-models/body-pix';\nimport dat from 'dat.gui';\nimport Stats from 'stats.js';\nimport {drawKeypoints, drawSkeleton, toggleLoadingUI, TRY_RESNET_BUTTON_NAME, TRY_RESNET_BUTTON_TEXT, updateTryResNetButtonDatGuiCss} from './demo_util';\nimport * as partColorScales from './part_color_scales';\n\nconst stats = new Stats();\nconst state = {\n  video: null,\n  stream: null,\n  net: null,\n  videoConstraints: {},\n  // Triggers the TensorFlow model to reload\n  changingArchitecture: false,\n  changingMultiplier: false,\n  changingStride: false,\n  changingResolution: false,\n  changingQuantBytes: false,\n};\n\nfunction isAndroid() {\n  return\n  /Android/i.test(navigator.userAgent);\n}\n\nfunction isiOS() {\n  return\n  /iPhone|iPod|iPad/i.test(navigator.userAgent);\n}\n\nfunction isMobile() {\n  return isAndroid() ||\n  isiOS();\n}\n\nasync function getVideoInputs() {\n  if (!navigator.mediaDevices ||\n  !navigator.mediaDevices.enumerateDevices) {\n    console.log('enumerateDevices() not supported.);\n    return [];\n  }\n\n  const devices = await navigator.mediaDevices.enumerateDevices();\n  const videoDevices =\n  devices.filter(device => device.kind === 'videoinput');\n  return videoDevices;\n}\n\nfunction\n  stopExistingVideoCapture() {\n  if (state.video && state.video.srcObject) {\n    state.video.srcObject.getTracks().forEach(track => {\n      track.stop();\n    });\n    state.video.srcObject = null;\n  }\n}\n\nasync function getIdForLabel(cameraLabel) {\n  const videoInputs = await getVideoInputs();\n  for (let i = 0; i < videoInputs.length; i++) {\n    const videoInput = videoInputs[i];\n    if (videoInput.label ===\n    cameraLabel) {\n      return videoInput.deviceId;\n    }\n  }\n  return null;\n}\n\n// on mobile, facing mode is the\n  preferred way to select a camera.\n  // Here we use the camera label to determine if its the environment or\n  // user\n  facing camera\n  function getFacingMode(cameraLabel) {\n    if (!cameraLabel) {\n      return 'user';\n    }\n    if\n    (cameraLabel.toLowerCase().includes('back')) {\n      return 'environment';\n    }\n    else {\n      return 'user';\n    }\n  }\n}\n\nasync function getConstraints(cameraLabel) {\n  let deviceId;\n  let facingMode;\n\n  if (cameraLabel) {\n    deviceId = await getIdForLabel(cameraLabel);\n    // on mobile, use the facing mode based on the camera.\n    facingMode = isMobile() ? getFacingMode(cameraLabel) : null;\n  }\n  return {deviceId, facingMode};\n}\n\n/**\n * Loads a the camera to be used in the demo\n */\n\nasync function setupCamera(cameraLabel) {\n  if\n  (!navigator.mediaDevices || !navigator.mediaDevices.getUserMedia) {\n    throw new Error(\n      'Browser API\n      navigator.mediaDevices.getUserMedia not available');\n  }\n\n  const videoElement =\n  document.getElementById('video');\n\n  stopExistingVideoCapture();\n\n  const videoConstraints = await\n  getConstraints(cameraLabel);\n\n  const stream = await navigator.mediaDevices.getUserMedia(\n    {\n      'audio': false,\n      'video': videoConstraints\n    });\n\n  videoElement.srcObject = stream;\n\n  return new Promise((resolve) => {\n    videoElement.onloadedmetadata = () => {\n      videoElement.width = videoElement.videoWidth;\n      videoElement.height = videoElement.videoHeight;\n      resolve(videoElement);\n    }\n  });\n}\n\nasync function
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loadVideo(cameraLabel) {\n try {\n state.video = await setupCamera(cameraLabel);\n } catch (e) {\n let info =
document.getElementById('info');\n info.textContent = 'this browser does not support video capture,' +\n 'or
this device does not have a camera';\n info.style.display = 'block';\n throw e;\n }\n\n
state.video.play();\n}\n\nconst defaultQuantBytes = 2;\nconst defaultMobileNetMultiplier = isMobile() ? 0.50 :
0.75;\nconst defaultMobileNetStride = 16;\nconst defaultMobileNetInternalResolution = 'medium';\nconst
defaultResNetMultiplier = 1.0;\nconst defaultResNetStride = 16;\nconst defaultResNetInternalResolution =
'low';\nconst guiState = {\n algorithm: 'multi-person-instance',\n estimate: 'partmap',\n camera: null,\n
flipHorizontal: true,\n input: {\n architecture: 'MobileNetV1',\n outputStride: 16,\n internalResolution: 'low',\n
multiplier: 0.50,\n quantBytes: 2\n },\n multiPersonDecoding: {\n maxDetections: 5,\n scoreThreshold:
0.3,\n nmsRadius: 20,\n numKeypointForMatching: 17,\n refineSteps: 10\n },\n segmentation: {\n
segmentationThreshold: 0.7,\n effect: 'mask',\n maskBackground: true,\n opacity: 0.7,\n
backgroundBlurAmount: 3,\n maskBlurAmount: 0,\n edgeBlurAmount: 3\n },\n partMap: {\n colorScale:
'rainbow',\n effect: 'partMap',\n segmentationThreshold: 0.5,\n opacity: 0.9,\n blurBodyPartAmount: 3,\n
bodyPartEdgeBlurAmount: 3\n },\n showFps: !isMobile();\n}\n\nfunction toCameraOptions(cameras) {\n const
result = {default: null};\n\n cameras.forEach(camera => {\n result[camera.label] = camera.label;\n })\n\n return
result;\n}\n\n/**\n * Sets up dat.gui controller on the top-right of the window\n */\n\nfunction setupGui(cameras) {\n
const gui = new dat.GUI({width: 300});\n\n let architectureController = null;\n
guiState[TRY_RESNET_BUTTON_NAME] = function() {\n architectureController.setValue('ResNet50')\n };\n
gui.add(guiState, TRY_RESNET_BUTTON_NAME).name(TRY_RESNET_BUTTON_TEXT);\n
updateTryResNetButtonDatGuiCss();\n\n gui.add(guiState, 'camera', toCameraOptions(cameras))\n
.onChange(async function(cameraLabel) {\n state.changingCamera = true;\n\n await
loadVideo(cameraLabel);\n\n state.changingCamera = false;\n });\n\n gui.add(guiState, 'flipHorizontal');\n\n
// There are two algorithms 'person' and 'multi-person-instance'.\n // The 'person' algorithm returns one single
segmentation mask (or body\n // part map) for all people in the image. The 'multi-person-instance'\n // algorithm
returns an array of segmentation mask (or body part map).\n // Each element in the array corresponding to one of
the people. In other\n // words, 'multi-person-instance' algorithm does instance-level person\n // segmentation and
body part segmentation for every person in the image.\n const algorithmController =\n gui.add(guiState,
'algorithm', ['person', 'multi-person-instance']);\n\n // Architecture: there are a few BodyPix models varying in size
and\n // accuracy.\n // The input parameters have the most effect on accuracy and speed of the\n // network\n let
input = gui.addFolder('Input');\n\n // Updates outputStride\n // Output stride: Internally, this parameter affects the
height and width\n // of the layers in the neural network. The lower the value of the output\n // stride the higher the
accuracy but slower the speed, the higher the\n // value the faster the speed but lower the accuracy.\n let
outputStrideController = null;\n function updateGuiOutputStride(outputStride, outputStrideArray) {\n if
(outputStrideController) {\n outputStrideController.remove();\n }\n guiState.input.outputStride =
outputStride;\n outputStrideController =\n input.add(guiState.input, 'outputStride', outputStrideArray);\n
outputStrideController.onChange(function(outputStride) {\n state.changingStride = true;\n
guiState.input.outputStride = +outputStride;\n });\n }\n\n // Updates internal resolution\n // Internal resolution:
Internally, this parameter affects the height and\n // width of the layers in the neural network. The higher the value
of the\n // internal resolution the better the accuracy but slower the speed.\n let internalResolutionController =
null;\n function updateGuiInternalResolution(\n internalResolution,\n internalResolutionArray,\n ) {\n if
(internalResolutionController) {\n internalResolutionController.remove();\n }\n
guiState.input.internalResolution = internalResolution;\n internalResolutionController = input.add(\n
guiState.input, 'internalResolution', internalResolutionArray);\n
internalResolutionController.onChange(function(internalResolution) {\n guiState.input.internalResolution =
internalResolution;\n });\n }\n\n // Updates depth multiplier\n // Multiplier: this parameter affects the number of
feature map channels\n // in the MobileNet. The higher the value, the higher the accuracy but\n // slower the speed,
the lower the value the faster the speed but lower\n // the accuracy.\n let multiplierController = null;\n function
updateGuiMultiplier(multiplier, multiplierArray) {\n if (multiplierController) {\n

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multiplierController.remove();\n  }\n  guiState.input.multiplier = multiplier;\n  multiplierController =\n  input.add(guiState.input, 'multiplier', multiplierArray);\n  multiplierController.onChange(function(multiplier) {\n  state.changingMultiplier = true;\n  guiState.input.multiplier = +multiplier;\n  });\n }\n\n // updates quantBytes\n // QuantBytes: this parameter affects weight quantization in the ResNet50\n // model. The available options are 1\n // byte, 2 bytes, and 4 bytes. The\n // higher the value, the larger the model size and thus the longer the\n // loading\n // time, the lower the value, the shorter the loading time but\n // lower the accuracy.\n let quantBytesController =\n null;\n function updateGuiQuantBytes(quantBytes, quantBytesArray) {\n  if (quantBytesController) {\n  quantBytesController.remove();\n  }\n  guiState.quantBytes = +quantBytes;\n  guiState.input.quantBytes =\n  +quantBytes;\n  quantBytesController =\n  input.add(guiState.input, 'quantBytes', quantBytesArray);\n  quantBytesController.onChange(function(quantBytes) {\n  state.changingQuantBytes = true;\n  guiState.input.quantBytes = +quantBytes;\n  });\n }\n\n function updateGuiInputSection() {\n  if\n  (guiState.input.architecture === 'MobileNetV1') {\n  updateGuiInternalResolution(\n  defaultMobileNetInternalResolution,\n  ['low', 'medium', 'high', 'full']);\n  updateGuiOutputStride(defaultMobileNetStride, [8, 16]);\n  updateGuiMultiplier(defaultMobileNetMultiplier,\n  [0.50, 0.75, 1.0])\n  } else { // guiState.input.architecture === 'ResNet50'\n  updateGuiInternalResolution(\n  defaultResNetInternalResolution, ['low', 'medium', 'high', 'full']);\n  updateGuiOutputStride(defaultResNetStride, [32, 16]);\n  updateGuiMultiplier(defaultResNetMultiplier, [1.0]);\n  }\n  updateGuiQuantBytes(defaultQuantBytes, [1, 2, 4]);\n }\n\n // Architecture: there are a few PoseNet models\n // varying in size and\n // accuracy. 1.01 is the largest, but will be the slowest. 0.50 is the\n // fastest, but least\n // accurate.\n architectureController =\n  input.add(guiState.input, 'architecture', ['ResNet50', 'MobileNetV1']);\n  guiState.architecture = guiState.input.architecture;\n  architectureController.onChange(function(architecture) {\n  //\n  // if architecture is ResNet50, then show ResNet50 options\n  state.changingArchitecture = true;\n  guiState.input.architecture = architecture;\n  updateGuiInputSection();\n  });\n\n  updateGuiInputSection();\n  input.open()\n\n  const estimateController =\n  gui.add(guiState, 'estimate', ['segmentation', 'partmap']);\n  let\n  segmentation = gui.addFolder('Segmentation');\n  segmentation.add(guiState.segmentation, 'segmentationThreshold',\n  0.0, 1.0);\n  const segmentationEffectController =\n  segmentation.add(guiState.segmentation, 'effect', ['mask',\n  'bokeh']);\n  let multiPersonDecoding = gui.addFolder('MultiPersonDecoding');\n  multiPersonDecoding.add(\n  guiState.multiPersonDecoding, 'maxDetections', 0, 20, 1);\n  multiPersonDecoding.add(\n  guiState.multiPersonDecoding, 'scoreThreshold', 0.0, 1.0);\n  multiPersonDecoding.add(\n  guiState.multiPersonDecoding, 'nmsRadius', 0, 30, 1);\n  multiPersonDecoding.add(\n  guiState.multiPersonDecoding, 'numKeypointForMatching', 1, 17, 1);\n  multiPersonDecoding.add(\n  guiState.multiPersonDecoding, 'refineSteps', 1, 10, 1);\n  multiPersonDecoding.open();\n\n  algorithmController.onChange(function(value) {\n  switch (guiState.algorithm) {\n  case 'single-person':\n  multiPersonDecoding.close();\n  singlePersonDecoding.open();\n  break;\n  case 'multi-person':\n  singlePersonDecoding.close();\n  multiPersonDecoding.open();\n  break;\n  }\n  });\n\n  let\n  darknessLevel;\n  let bokehBlurAmount;\n  let edgeBlurAmount;\n  let maskBlurAmount;\n  let\n  maskBackground;\n\n  segmentationEffectController.onChange(function(effectType) {\n  if (effectType ===\n  'mask') {\n  if (bokehBlurAmount) {\n  bokehBlurAmount.remove();\n  }\n  if (edgeBlurAmount) {\n  edgeBlurAmount.remove();\n  }\n  darknessLevel =\n  segmentation.add(guiState.segmentation, 'opacity',\n  0.0, 1.0);\n  maskBlurAmount = segmentation.add(guiState.segmentation, 'maskBlurAmount')\n  .min(0)\n  .max(20)\n  .step(1);\n  maskBackground =\n  segmentation.add(guiState.segmentation, 'maskBackground');\n  } else if (effectType === 'bokeh') {\n  if\n  (darknessLevel) {\n  darknessLevel.remove();\n  }\n  if (maskBlurAmount) {\n  maskBlurAmount.remove();\n  }\n  if (maskBackground) {\n  maskBackground.remove();\n  }\n  bokehBlurAmount = segmentation\n  .add(\n  guiState.segmentation,\n  'backgroundBlurAmount',\n  )\n  .min(1)\n  .max(20)\n  .step(1);\n  edgeBlurAmount = segmentation.add(guiState.segmentation, 'edgeBlurAmount')\n  .min(0)\n  .max(20)\n  .step(1);\n  }\n  });\n\n  // manually set the effect so

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that the options are shown.\n segmentationEffectController.setValue(guiState.segmentation.effect);\n\n let partMap
= gui.addFolder('Part Map');\n partMap.add(guiState.partMap, 'segmentationThreshold', 0.0, 1.0);\n
partMap.add(\n  guiState.partMap, 'effect', ['partMap', 'pixelation', 'blurBodyPart']);\n
partMap.add(guiState.partMap, 'opacity', 0.0, 1.0);\n partMap.add(guiState.partMap, 'colorScale',
Object.keys(partColorScales))\n  .onChange(colorScale => {\n    setShownPartColorScales(colorScale);\n
  });\n setShownPartColorScales(guiState.partMap.colorScale);\n partMap.add(guiState.partMap,
'blurBodyPartAmount').min(1).max(20).step(1);\n partMap.add(guiState.partMap, 'bodyPartEdgeBlurAmount')\n
.min(1)\n  .max(20)\n  .step(1);\n partMap.open();\n\n estimateController.onChange(function(estimationType)
{\n  if (estimationType === 'segmentation') {\n    segmentation.open();\n    partMap.close();\n
document.getElementById('colors').style.display = 'none';\n  } else {\n    segmentation.close();\n
partMap.open();\n    document.getElementById('colors').style.display = 'inline-block';\n  }\n });\n\n
gui.add(guiState, 'showFps').onChange(showFps => {\n  if (showFps) {\n
document.body.appendChild(stats.dom);\n  } else {\n    document.body.removeChild(stats.dom);\n  }\n
})\n\nfunction setShownPartColorScales(colorScale) {\n  const colors = document.getElementById('colors');\n
colors.innerHTML = '';\n\n  const partColors = partColorScales[colorScale];\n  const partNames =
bodyPix.PART_CHANNELS;\n\n  for (let i = 0; i < partColors.length; i++) {\n    const partColor = partColors[i];\n
const child = document.createElement('li');\n\n    child.innerHTML = `\n    <div class='color' style='background-
color:rgb(${partColor[0]},${partColor[1]},${partColor[2]})` ></div>\n    ${partNames[i]}`;\n\n
colors.appendChild(child);\n  }\n\n  /**\n * Sets up a frames per second panel on the top-left of the window\n
*\nfunction setupFPS() {\n  stats.showPanel(0); // 0: fps, 1: ms, 2: mb, 3+: custom\n  if (guiState.showFps) {\n
document.body.appendChild(stats.dom);\n  }\n\n  async function estimateSegmentation() {\n    let
multiPersonSegmentation = null;\n    switch (guiState.algorithm) {\n      case 'multi-person-instance':\n        return await
state.net.segmentMultiPerson(state.video, {\n          internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n          maxDetections:
guiState.multiPersonDecoding.maxDetections,\n          scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n          nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
numKeypointForMatching: guiState.multiPersonDecoding.numKeypointForMatching,\n          refineSteps:
guiState.multiPersonDecoding.refineSteps\n        });\n      case 'person':\n        return await
state.net.segmentPerson(state.video, {\n          internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n          maxDetections:
guiState.multiPersonDecoding.maxDetections,\n          scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n          nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
        });\n      default:\n        break;\n    });\n    return multiPersonSegmentation;\n  }\n\n  async function
estimatePartSegmentation() {\n    switch (guiState.algorithm) {\n      case 'multi-person-instance':\n        return await
state.net.segmentMultiPersonParts(state.video, {\n          internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n          maxDetections:
guiState.multiPersonDecoding.maxDetections,\n          scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n          nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
numKeypointForMatching: guiState.multiPersonDecoding.numKeypointForMatching,\n          refineSteps:
guiState.multiPersonDecoding.refineSteps\n        });\n      case 'person':\n        return await
state.net.segmentPersonParts(state.video, {\n          internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n          maxDetections:
guiState.multiPersonDecoding.maxDetections,\n          scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n          nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
        });\n      default:\n        break;\n    });\n    return multiPersonPartSegmentation;\n  }\n\nfunction
drawPoses(personOrPersonPartSegmentation, flipHorizontally, ctx) {\n  if
(Array.isArray(personOrPersonPartSegmentation)) {\n
personOrPersonPartSegmentation.forEach(personSegmentation => {\n    let pose = personSegmentation.pose;\n

```

```

if (flipHorizontally) {\n    pose = bodyPix.flipPoseHorizontal(pose, personSegmentation.width);\n    }\n
drawKeypoints(pose.keypoints, 0.1, ctx);\n    drawSkeleton(pose.keypoints, 0.1, ctx);\n    });\n    } else {\n
personOrPersonPartSegmentation.allPoses.forEach(pose => {\n    if (flipHorizontally) {\n    pose =
bodyPix.flipPoseHorizontal(\n    pose, personOrPersonPartSegmentation.width);\n    }\n
drawKeypoints(pose.keypoints, 0.1, ctx);\n    drawSkeleton(pose.keypoints, 0.1, ctx);\n    });\n    }\n}\n\nasync
function loadBodyPix() {\n    toggleLoadingUI(true);\n    state.net = await bodyPix.load({\n    architecture:
guiState.input.architecture,\n    outputStride: guiState.input.outputStride,\n    multiplier: guiState.input.multiplier,\n
quantBytes: guiState.input.quantBytes\n    });\n    toggleLoadingUI(false);\n    }\n\n/**\n * Feeds an image to BodyPix to
estimate segmentation - this is where the\n * magic happens. This function loops with a requestAnimationFrame
method.\n */\nfunction segmentBodyInRealTime() {\n    const canvas = document.getElementById('output');\n    //
since images are being fed from a webcam\n\n    async function bodySegmentationFrame() {\n    // if changing the
model or the camera, wait a second for it to complete\n    // then try again.\n    if (state.changingArchitecture ||
state.changingMultiplier ||\n    state.changingCamera || state.changingStride ||\n    state.changingQuantBytes)
{\n    console.log('load model...');\n    loadBodyPix();\n    state.changingArchitecture = false;\n
state.changingMultiplier = false;\n    state.changingStride = false;\n    state.changingQuantBytes = false;\n    }\n
\n    // Begin monitoring code for frames per second\n    stats.begin();\n\n    const flipHorizontally =
guiState.flipHorizontal;\n\n    switch (guiState.estimate) {\n    case 'segmentation':\n    const
multiPersonSegmentation = await estimateSegmentation();\n    switch (guiState.segmentation.effect) {\n
case 'mask':\n    const ctx = canvas.getContext('2d');\n    const foregroundColor = {r: 255, g: 255, b: 255,
a: 255};\n    const backgroundColor = {r: 0, g: 0, b: 0, a: 255};\n    const mask = bodyPix.toMask(\n
multiPersonSegmentation, foregroundColor, backgroundColor,\n    true);\n\n    bodyPix.drawMask(\n
canvas, state.video, mask, guiState.segmentation.opacity,\n
guiState.segmentation.maskBlurAmount, flipHorizontally);\n    drawPoses(multiPersonSegmentation,
flipHorizontally, ctx);\n    break;\n    case 'bokeh':\n    bodyPix.drawBokehEffect(\n    canvas,
state.video, multiPersonSegmentation,\n    +guiState.segmentation.backgroundBlurAmount,\n
guiState.segmentation.edgeBlurAmount, flipHorizontally);\n    break;\n    }\n\n    break;\n    case
'partmap':\n    const ctx = canvas.getContext('2d');\n    const multiPersonPartSegmentation = await
estimatePartSegmentation();\n    const coloredPartImageData = bodyPix.toColoredPartMask(\n
multiPersonPartSegmentation,\n    partColorScales[guiState.partMap.colorScale]);\n\n    const
maskBlurAmount = 0;\n    switch (guiState.partMap.effect) {\n    case 'pixelation':\n    const
pixelCellWidth = 10.0;\n\n    bodyPix.drawPixelatedMask(\n    canvas, state.video,
coloredPartImageData,\n    guiState.partMap.opacity, maskBlurAmount, flipHorizontally,\n
pixelCellWidth);\n    break;\n    case 'partMap':\n    bodyPix.drawMask(\n    canvas,
state.video, coloredPartImageData, guiState.opacity,\n    maskBlurAmount, flipHorizontally);\n
break;\n    case 'blurBodyPart':\n    const blurBodyPartIds = [0, 1];\n    bodyPix.blurBodyPart(\n
canvas, state.video, multiPersonPartSegmentation,\n    blurBodyPartIds,
guiState.partMap.blurBodyPartAmount,\n    guiState.partMap.edgeBlurAmount, flipHorizontally);\n    }\n
\n    drawPoses(multiPersonPartSegmentation, flipHorizontally, ctx);\n    break;\n    default:\n    break;\n
}\n\n    // End monitoring code for frames per second\n    stats.end();\n\n    requestAnimationFrame(bodySegmentationFrame);\n    }\n\n    bodySegmentationFrame();\n    }\n\n\n/**\n * Kicks off the
demo.\n */\nexport async function bindPage() {\n    // Load the BodyPix model weights with architecture 0.75\n
await loadBodyPix();\n    document.getElementById('loading').style.display = 'none';\n
document.getElementById('main').style.display = 'inline-block';\n\n    await loadVideo(guiState.camera);\n\n    let
cameras = await getVideoInputs();\n\n    setupFPS();\n    setupGui(cameras);\n\n    segmentBodyInRealTime();\n    }\n\n\nnavigator.getUserMedia = navigator.getUserMedia ||\n
navigator.webkitGetUserMedia || navigator.mozGetUserMedia;\n\n// kick off the demo\nbindPage();\n}

```

Found in path(s):

1.275 reactor-netty 0.9.11.RELEASE

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```
/*           ZeusBench V1.01
=====
```

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Written by Adam Twiss (adam@zeus.co.uk). March 1996

Thanks to the following people for their input:

Mike Belshe (mbelshe@netscape.com)

Michael Campanella (campanella@stevms.enet.dec.com)

```
*/
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" lang="en" xml:lang="en"><head>
<meta content="text/html; charset=ISO-8859-1" http-equiv="Content-Type" />
<!--
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
    This file is generated from xml source: DO NOT EDIT
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
-->
<title>The Apache License, Version 2.0 - Apache HTTP Server Version 2.4</title>
<link href="/style/css/manual.css" rel="stylesheet" media="all" type="text/css" title="Main stylesheet" />
<link href="/style/css/manual-loose-100pc.css" rel="alternate stylesheet" media="all" type="text/css" title="No Sidebar - Default font size" />
<link href="/style/css/manual-print.css" rel="stylesheet" media="print" type="text/css" /><link rel="stylesheet" type="text/css" href="/style/css/prettify.css" />
<script src="/style/scripts/prettify.min.js" type="text/javascript">
</script>
```

```
<link href="/images/favicon.ico" rel="shortcut icon" /></head>
<body id="manual-page" class="no-sidebar"><div id="page-header">
<p class="menu"><a href="/mod/">Modules</a> | <a href="/mod/directives.html">Directives</a> | <a
href="http://wiki.apache.org/httpd/FAQ">FAQ</a> | <a href="/glossary.html">Glossary</a> | <a
href="/sitemap.html">Sitemap</a></p>
<p class="apache">Apache HTTP Server Version 2.4</p>
</div>
<div class="up"><a href="/"></a></div>
<div id="path">
<a href="http://www.apache.org/">Apache</a> > <a href="http://httpd.apache.org/">HTTP Server</a> > <a
href="http://httpd.apache.org/docs/">Documentation</a> > <a href="/">Version 2.4</a></div><div id="page-
content"><div id="preamble"><h1>The Apache License, Version 2.0</h1>
<div class="toplant">
<p><span>Available Languages: </span><a href="/en/license.html" title="English">&nbsp;en&nbsp;&nbsp;</a></p>
</div>
```

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</div>

</div>

<div class="bottomlang">

<p>Available Languages: en </p>

</div><div class="top"></div><div

class="section"><h2>Comments</h2><div

class="warning">Notice:
This is not a Q&A section. Comments placed here should be

pointed towards suggestions on improving the documentation or server, and may be removed again by our moderators if they are either implemented or considered invalid/off-topic. Questions on how to manage the Apache

HTTP Server should be directed at either our IRC channel, #httpd, on Freenode, or sent to our mailing lists</div>

<script type="text/javascript"><!--><![CDATA[//><!--

var comments_shortcode = 'httpd';

var comments_identifier = 'http://httpd.apache.org/docs/2.4/license.html';

(function(w, d) {

if (w.location.hostname.toLowerCase() == "httpd.apache.org") {

```

d.write('<div id="comments_thread"></div>');
var s = d.createElement('script');
s.type = 'text/javascript';
s.async = true;
s.src = 'https://comments.apache.org/show_comments.lua?site=' + comments_shortcode + '&page=' +
comments_identifier;
(d.getElementsByTagName('head')[0] || d.getElementsByTagName('body')[0]).appendChild(s);
}
else {
d.write('<div id="comments_thread">Comments are disabled for this page at the moment.</div>');
}
})(window, document);
!--><![></script></div><div id="footer">
<p class="apache">Copyright 2019 The Apache Software Foundation.<br />Licensed under the <a
href="http://www.apache.org/licenses/LICENSE-2.0">Apache License, Version 2.0</a>.</p>
<p class="menu"><a href="/mod/">Modules</a> | <a href="/mod/directives.html">Directives</a> | <a
href="http://wiki.apache.org/httpd/FAQ">FAQ</a> | <a href="/glossary.html">Glossary</a> | <a
href="/sitemap.html">Sitemap</a></p></div><script type="text/javascript"><!--><![CDATA[<!--><!--
if (typeof(prettyPrint) !== 'undefined') {
prettyPrint();
}
--><![></script>
</body></html>

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1.277 heimdal 7.7.0+dfsg-1ubuntu1

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@vskip 20pt plus 1fil  
@end macro
```

```
@macro copyrightstart{ }  
@end macro
```

```
@macro copyrightend{ }  
@end macro
```

```
@node Copyrights and Licenses, , Acknowledgments, Top  
@comment node-name, next, previous, up  
@appendix Copyrights and Licenses
```

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```
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@verbatim
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GSS-API mechg glue layer.

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@table @asis

@item GSS-API CFX, SPNEGO, naming extensions, API extensions.

@item KCM credential cache.

@item HDB LDAP backend.

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@heading Vincent Rijmen, Antoon Bosselaers, Paulo Barreto

AES in libcrypto

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rijndael-alg-fst.c

@version 3.0 (December 2000)

Optimised ANSI C code for the Rijndael cipher (now AES)

@author Vincent Rijmen <vincent.rijmen@esat.kuleuven.ac.be>

@author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>

@author Paulo Barreto <paulo.barreto@terra.com.br>

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DES core in libcrypto

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D3DES (V5.09) -

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Thanks to: Dan Hoey for his excellent Initial and Inverse permutation code; Jim Gillogly & Phil Karn for the DES key schedule code; Dennis Ferguson, Eric Young and Dana How for comparing notes; and Ray Lau, for humouring me on.

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Windows support

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lib/hcrypto/test_dh.c

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1.281 kmod 23

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1.285 hdrhistogram 2.1.12

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Manifest-Version: 1.0

Bnd-LastModified: 1575980548657

Build-Jdk: 1.8.0_232

Built-By: gil

Bundle-Description: HdrHistogram supports the recording and analyzing sampled data value counts across a configurable integer value range with configurable value precision within the range. Value precision is expressed as the number of significant digits in the value recording, and provides control over value quantization behavior across the value range and the subsequent value resolution at any given level.

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Bundle-ManifestVersion: 2

Bundle-Name: HdrHistogram

Bundle-SymbolicName: org.hdrhistogram.HdrHistogram

Bundle-Version: 2.1.12

Created-By: Apache Maven Bundle Plugin

Export-Package: org.HdrHistogram;version="2.1.12",org.HdrHistogram.packagedarray;version="2.1.12"

Implementation-Title: HdrHistogram

Implementation-Vendor-Id: org.hdrhistogram
Implementation-Version: 2.1.12
Require-Capability: osgi.ee;filter:=("&(osgi.ee=JavaSE)(version=1.7)")
Specification-Title: HdrHistogram
Specification-Version: 2.1.12
Tool: Bnd-2.3.0.201405100607

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1.286 springdoc-openapi-common 1.5.9

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Gocheck - A rich testing framework for Go

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Go support for Protocol Buffers - Google's data interchange format

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Support for streaming Protocol Buffer messages for the Go language (golang).

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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Protocol Buffers for Go with Gadgets

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<http://github.com/gogo/protobuf>

Go support for Protocol Buffers - Google's data interchange format

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The primary ANTLR guy:

Terence Parr
parrt@cs.usfca.edu
parrt@antlr.org

1.289 ehcache-xml 3.8.1

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Found in path(s):

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- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultCacheEventDispatcherConfigurationParser.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/CoreServiceCreationConfigurationParser.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultSerializerConfigurationParser.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/CoreCacheConfigurationParser.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/OffHeapDiskStoreProviderConfigurationParser.java
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- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/ServiceCreationConfigurationParser.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/XmlConfiguration.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/DefaultSizeOfEngineProviderConfigurationParser.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/model/SizeOfEngineLimits.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/model/CacheTemplate.java
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- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/model/CacheSpec.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/PooledExecutionServiceConfigurationParser.java
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- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/ThreadPoolServiceCreationConfigurationParser.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultCacheLoaderWriterConfigurationParser.java
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- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/model/CacheDefinition.java
- * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/JaxbHelper.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/BaseConfigParser.java
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 * /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/CacheEventDispatcherFactoryConfigurationParser.java

1.290 inja 3.1.0

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1.291 jansi-native 1.8

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1.292 tcp-dump 4.9.2

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1.293 springdoc-openapi-webmvc-core 1.5.9

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1.294 libvmtools 9.4.0.25793

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1.296 micrometer-core 1.5.4

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/OkHttpSender.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/logging/LoggingRegistryConfig.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/ReactorNettySender.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/logging/LoggingMeterRegistry.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/push/PushRegistryConfig.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/StrongReferenceGaugeFunction.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/HttpSender.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/kafka/KafkaConsumerMetrics.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/HttpStatusClass.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/util/NamedThreadFactory.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/util/JsonUtils.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/push/PushMeterRegistry.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/MultiGauge.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/URLConnectionSender.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/internal/OnlyOnceLoggingDenyMeterFilter.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/httpcomponents/PoolingHttpClientConnectionManagerMetricsBinder.java

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- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/Timer.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/internal/TimerScheduledExecutorService.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/InstrumentedQueuedThreadPool.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/WarnThenDebugLogger.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/TimerHandler.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/internal/TimerCallable.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/mongodb/MongoMetricsCommandListener.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jvm/JvmMemory.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/internal/TimerRunnable.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/mongodb/MongoMetricsConnectionPoolListener.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/JettyServerThreadPoolMetrics.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/JettyConnectionMetrics.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
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- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/JettyClientTags.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/validate/Validated.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/http/package-info.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/httpcomponents/HttpContextUtils.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/httpcomponents/MicrometerHttpClientInterceptor.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/validate/InvalidReason.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/validate/DurationValidator.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/http/HttpServletRequestTagsProvider.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/validate/PropertyValidator.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/step/StepTuple2.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/db/JooqExecuteListener.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/distribution/FixedBoundaryVictoriaMetricsHistogram.java
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- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/validate/ValidationException.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/db/MetricsDSLContext.java
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- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/http/DefaultHttpServletRequestTagsProvider.java
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- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/kafka/KafkaMetrics.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jpa/HibernateQueryMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/MeterRegistryConfigValidator.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/JettyClientMetrics.java
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*/

Found in path(s):

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/distribution/NoopHistogram.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/MockClock.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/cache/CacheMeterBinder.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/hystrix/HystrixMetricsBinder.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/step/StepMeterRegistry.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/lang/NonNullApi.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/distribution/TimeWindowMax.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/CaffeineCacheMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/simple/SimpleMeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/TimeGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/MeterEquivalence.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/MissingRequiredConfigurationException.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/annotation/Timed.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Measurement.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/NoPauseDetector.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/db/DatabaseTableMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/logging/Log4j2Metrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/aop/CountedAspect.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/StringEscapeUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/search/RequiredSearch.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/okhttp3/OkHttpMetricsEventListener.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/ImmutableTag.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/annotation/TimedSet.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepLong.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/LongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/binder/BaseUnits.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/MeterPartition.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopLongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeLongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/hystrix/MicrometerMetricsPublisherCommand.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/DistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/aop/TimedAspect.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/PauseDetector.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/EhCache2Metrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/Mergeable.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/system/FileDescriptorMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Tags.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Statistic.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardMeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/MeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Metrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/lang/Nullable.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/DiskSpaceMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/push/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/step/StepTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/logging/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/TimeUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopTimeGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/simple/CountingMode.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeMeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/AbstractTimeWindowHistogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepRegistryConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Meter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeCustomMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeTimeGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmCompilationMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/MeterRegistryConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/simple/SimpleConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/InvalidConfigurationException.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmThreadMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Clock.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/AbstractTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/HierarchicalNameMapper.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/JCacheMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/internal/DefaultMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepDouble.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/AbstractMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/AbstractCompositeMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/search/MeterNotFoundException.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/system/UptimeMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/HistogramGauges.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/MeterBinder.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/IOUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/hystrix/MicrometerMetricsPublisherThreadPool.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/db/PostgreSQLDatabaseMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/MeterFilter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/PercentileHistogramBuckets.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepMeasurement.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/system/ProcessorMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/ValueAtPercentile.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/FunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/Histogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/MeterFilterReply.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/CountAtBucket.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/util/DoubleFormat.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/TimedExecutor.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/StringUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmMemoryMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/annotation/Incubating.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/TimeWindowPercentileHistogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/tomcat/TomcatMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/HistogramSnapshot.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/TimedExecutorService.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/HistogramSupport.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/annotation/Counted.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/ClockDriftPauseDetector.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/dropwizard/DropwizardRate.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/search/Search.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/FunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmGcMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/lang/NonNullFields.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Tag.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/AbstractPartition.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardClock.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/AbstractDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/DefaultLongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/search/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/hystrix/MicrometerMetricsPublisher.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/HazelcastCacheMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/NamingConvention.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/lang/NonNull.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/logging/LogbackMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/Counter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/ClassLoaderMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/GuavaCacheMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/ExecutorServiceMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/DefaultGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jpa/HibernateMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/TimeWindowFixedBoundaryHistogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/simple/package-info.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
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*/opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
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- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/Slf4JLoggerFactory.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/InternalLogLevel.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/Slf4JLogger.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/AbstractInternalLogger.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/InternalLoggerFactory.java
- * /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/JdkLoggerFactory.java

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1.299 lz4 1.9.2-2ubuntu0.20.04.1

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Upstream-Name: lz4

Source: <https://github.com/Cyan4973/lz4>

Files: *

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1.300 spring-security-config 5.3.4.RELEASE

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* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/debug/SecurityDebugBeanFactoryPostProcessor.java

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- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/session/SessionConcurrencyDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/OAuth2ClientBeanDefinitionParser.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/server/ServerHttpSecurity.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/FrameOptionsDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/ReferrerPolicyDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/XssProtectionConfigDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/PortMapperDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/FormLoginDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/AuthorizeRequestsDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/CsrfDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/resourceserver/JwtDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/AuthenticationConfigBuilder.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/RequestCacheDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/OAuth2LoginBeanDefinitionParser.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/SecurityMarker.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/resourceserver/OpaqueTokenDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/HttpSecurityDsl.kt

- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/LogoutDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/Saml2Dsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/login/RedirectionEndpointDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/login/UserInfoEndpointDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/login/TokenEndpointDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/session/SessionFixationDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/client/AuthorizationCodeGrantDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/SecurityFilters.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configuration/SecurityReactorContextConfiguration.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/HttpPublicKeyPinningDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/HttpStrictTransportSecurityDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/ContentTypeOptionsDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/Elements.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/ContentSecurityPolicyDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/CacheControlDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/oauth2/client/ClientRegistrationsBeanDefinitionParser.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/SessionManagementDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/HttpSecurityBeanDefinitionParser.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/oauth2/server/resource/OAuth2ResourceServerConfigurer.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/AbstractRequestMatcherDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/builders/WebSecurity.java
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/OAuth2LoginDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/ExceptionHandlingDsl.kt
- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-

jar/org/springframework/security/config/http/CsrfBeanDefinitionParser.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/HttpConfigurationBuilder.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/CorsDsl.kt
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/OAuth2ClientDsl.kt
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/AnonymousDsl.kt
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/oauth2/login/AuthorizationEndpointDsl.kt
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/OAuth2ResourceServerDsl.kt
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* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/OAuth2ResourceServerBeanDefinitionParser.java
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jar/org/springframework/security/config/web/servlet/RequiresChannelDsl.kt
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
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jar/org/springframework/security/config/annotation/method/configuration/MethodSecurityMetadataSourceAdvisorR  
egistrar.java  
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/websocket/WebSocketMessageBrokerSecurityBeanDefinitionParser.java  
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/method/configuration/GlobalMethodSecuritySelector.java  
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
```

jar/org/springframework/security/config/annotation/web/configurers/oauth2/client/OAuth2ClientConfigurerUtils.java
a
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/authentication/configurers/ldap/LdapAuthenticationProviderCon-
figurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configuration/WebSecurityConfigurerAdapter.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configuration/EnableWebSecurity.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/ExpressionUrlAuthorizationConfigurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
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jar/org/springframework/security/config/method/GlobalMethodSecurityBeanDefinitionParser.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/ServletApiConfigurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/oauth2/client/CommonOAuth2Provider.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/authentication/AuthenticationManagerBeanDefinitionParser.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/CorsBeanDefinitionParser.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/UrlAuthorizationConfigurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/configuration/AutowireBeanFactoryObjectPostProcessor.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/core/userdetails/UserDetailsResourceFactoryBean.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/SecurityContextConfigurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/ExceptionHandlerConfigurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/CorsConfigurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/X509Configurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/HandlerMappingIntrospectorFactoryBean.java

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* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/rsocket/RSocketSecurityConfiguration.java

* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/rsocket/EnableRSocketSecurity.java

* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/rsocket/SecuritySocketAcceptorInterceptorConfiguration.java

* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/rsocket/PayloadInterceptorOrder.java

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- * /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/oauth2/client/OAuth2LoginConfigurer.java
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* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/core/userdetails/UserDetailsMapFactoryBean.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/method/configuration/EnableReactiveMethodSecurity.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/oauth2/client/ImplicitGrantConfigurer.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/server/SecurityWebFiltersOrder.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/core/userdetails/ReactiveUserDetailsServiceResourceFactoryBean.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/provisioning/UserDetailsManagerResourceFactoryBean.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/server/AbstractServerWebExchangeMatcherRegistry.java
```

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*/
```

Found in path(s):

```
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/method/MethodConfigUtils.java
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/WebConfigUtils.java
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```
* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
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```

1.301 glibc 2.31-0ubuntu9

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```

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```
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```

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```
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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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1.305 gnulib 2019-09-23

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A "Combined Work" is a work produced by combining or linking an Application with the Library. The particular version of the Library with which the Combined Work was made is also called the "Linked

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- b) under the GNU GPL, with none of the additional permissions of this License applicable to that copy.

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The object code form of an Application may incorporate material from a header file that is part of the Library. You may convey such object code under terms of your choice, provided that, if the incorporated material is not limited to numerical parameters, data structure layouts and accessors, or small macros, inline functions and templates (ten or fewer lines in length), you do both of the following:

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- c) For a Combined Work that displays copyright notices during execution, include the copyright notice for the Library among these notices, as well as a reference directing the user to the copies of the GNU GPL and this license document.
- d) Do one of the following:
 - 0) Convey the Minimal Corresponding Source under the terms of this License, and the Corresponding Application Code in a form suitable for, and under terms that permit, the user to recombine or relink the Application with a modified version of the Linked Version to produce a modified Combined Work, in the manner specified by section 6 of the GNU GPL for conveying Corresponding Source.
 - 1) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (a) uses at run time a copy of the Library already present on the user's computer system, and (b) will operate properly with a modified version of the Library that is interface-compatible with the Linked Version.
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Files:

tests/test-update-copyright.sh

Depends-on:

configure.ac:

```
abs_aux_dir=`cd "$ac_aux_dir"; pwd`
```

```
AC_SUBST([abs_aux_dir])
```


Makefile.am:

TESTS += test-update-copyright.sh

TESTS_ENVIRONMENT += abs_aux_dir='\$(abs_aux_dir)'

@c The GNU Lesser General Public License.

@center Version 2.1, February 1999

@c This file is intended to be included within another document,

@c hence no sectioning command or @node.

@display

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@end display

@subheading Preamble

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Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the @dfn{Lesser} General Public License because it does @emph{Less} to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain

special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a ``work based on the library" and a ``work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

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@enumerate 0

@item

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``Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

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@item

You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

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If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

@end enumerate

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

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@item

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

@item

A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a ``work that uses the Library''. Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a ``work that uses the Library'' with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a ``work that uses the library''. The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a ``work that uses the Library'' uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may

distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

@item

As an exception to the Sections above, you may also combine or link a ``work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

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Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable ``work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

@item

Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

@item

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Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

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@end enumerate

@subheading END OF TERMS AND CONDITIONS

@page

@subheading How to Apply These Terms to Your New Libraries

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@smallexample

@var{one line to give the library's name and an idea of what it does.}

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@end smallexample

Also add information on how to contact you by electronic and paper mail.

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@smallexample

Yoyodyne, Inc., hereby disclaims all copyright interest in the library `Frob' (a library for tweaking knobs) written by James Random Hacker.

@var{signature of Ty Coon}, 1 April 1990

Ty Coon, President of Vice

@end smallexample

That's all there is to it!

Files:

tests/test-canonicalize-lgpl.c

tests/signature.h

tests/null-ptr.h

tests/macros.h

Depends-on:

ignore-value

same-inode

symlink

configure.ac:

Makefile.am:

TESTS += test-canonicalize-lgpl

check_PROGRAMS += test-canonicalize-lgpl

\$Id: COPYING,v 1.3 2006-10-26 16:20:28 eggert Exp \$

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@c The GNU General Public License.

@center Version 2, June 1991

@c This file is intended to be included within another document,

@c hence no sectioning command or @node.

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@heading Preamble

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Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

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Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

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@end enumerate

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@center END OF TERMS AND CONDITIONS

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@page

@heading Appendix: How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the ``copyright" line and a pointer to where the full notice is found.

```
@smallexample
@var{one line to give the program's name and a brief idea of what it does.}
Copyright (C) @var{yyyy} @var{name of author}
```

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.
@end smallexample

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
@smallexample
Gnomovision version 69, Copyright (C) @var{year} @var{name of author}
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
@end smallexample
```

The hypothetical commands @samp{show w} and @samp{show c} should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than @samp{show w} and @samp{show c}; they could even be mouse-clicks or menu items---whatever suits your program.

You should also get your employer (if you work as a programmer) or your

school, if any, to sign a ``copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

@example

Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.

@var{signature of Ty Coon}, 1 April 1989

Ty Coon, President of Vice

@end example

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Lesser General Public License instead of this License.

Description:

Concatenate two arbitrary file names.

Files:

lib/filenamecat.h

lib/filenamecat-lgpl.c

m4/filenamecat.m4

Depends-on:

dirname-lgpl

configure.ac:

gl_FILE_NAME_CONCAT_LGPL

Makefile.am:

lib_SOURCES += filenamecat-lgpl.c

Include:

"filenamecat.h"

License:

LGPLv2+

Maintainer:

Jim Meyering

Please email the following information to assign@gnu.org, and we will send you the assignment form for your past and future changes.

Please use your full legal name (in ASCII characters) as the subject line of the message.

REQUEST: SEND FORM FOR PAST AND FUTURE CHANGES

[What is the name of the program or package you're contributing to?]

[Did you copy any files or text written by someone else in these changes?
Even if that material is free software, we need to know about it.]

[Do you have an employer who might have a basis to claim to own
your changes? Do you attend a school which might make such a claim?]

[For the copyright registration, what country are you a citizen of?]

[What year were you born?]

[Please write your email address here.]

[Please write your postal address here.]

[Which files have you changed so far, and which new files have you written
so far?]

Description:

Provide the GNU Free Documentation License in Texinfo format.

Files:

doc/fdl.texi

Depends-on:

configure.ac:

Makefile.am:

Include:

License:

unmodifiable license text

Maintainer:

all

Description:

Help make libraries relocatable, that is, to allow them to function properly when copied to an arbitrary directory.

Files:

doc/relocatable.texi
lib/relocatable.h
lib/relocatable.c
lib/relocatable.valgrind
m4/relocatable-lib.m4

Depends-on:

strdup

configure.ac:

```
gl_RELOCATABLE_LIBRARY
if test $RELOCATABLE = yes; then
  AC_LIBOBJ([relocatable])
fi
```

Makefile.am:

```
DEFS += -DNO_XMALLOC
```

Include:

```
"relocatable.h"
```

License:

GPLv2+

Maintainer:

Ben Pfaff

Description:

Ensure getcwd(NULL, 0) returns a buffer allocated by the malloc() function.

Files:

lib/getcwd-lgpl.c
m4/getcwd.m4

Depends-on:

unistd
strdup [test \$REPLACE_GETCWD = 1]

configure.ac:

```
gl_FUNC_GETCWD_LGPL
if test $REPLACE_GETCWD = 1; then
  AC_LIBOBJ([getcwd-lgpl])
fi
gl_UNISTD_MODULE_INDICATOR([getcwd])
```

Makefile.am:

Include:

<unistd.h>

License:

LGPLv2+

Maintainer:

Eric Blake

Legal Issues about Contributing Code to GNU last updated 14 July 2015

Project GNU has to be careful to obey copyright laws, even though these laws are wrong when they stop people from sharing generally useful published information such as software, because we are in the public eye. We also use copyright to defend users' freedom, by means of copyleft (though this does not excuse copyright law for helping to make software proprietary).

This means that if you want to contribute software to GNU, you have to do something to give us legal permission to use it. There are three ways this can be done:

* Assign the copyright to the Free Software Foundation.

This allows the FSF to act to stop violations of the GPL.

* Keep the copyright and release the program yourself under the GNU GPL. (This alternative is too impractical for contributions to a preexisting FSF-copyrighted GNU program.)

* Put the code in the public domain. Then there is nothing to stop hoarding of modified versions, but we can still use the program in GNU.

Most of these alternatives require a signed piece of paper, or in some cases a digital signature, to make it happen.

* Assigning copyright.

Assigning the copyright means signing a contract that makes the Free Software Foundation the "owner" of the program according to the law. As the copyright holder, the Foundation can sue anyone who tries to distribute the program as a proprietary product. We are willing to keep your name on the program as the author for as long as the program remains recognizably distinct. ("Owner" is in quotes to show that we don't really believe in this kind of ownership.)

The assignment contract commits the foundation to setting distribution

terms that permit free redistribution.

Often we don't want to do the work of starting to distribute a program right away. There are many things which we will need in order to have a complete system but which aren't really useful until the rest of the system is done. But signing the assignment does not stop you from distributing the program yourself--as long as you do so under the GNU terms. You don't have to wait for us to start distributing. You can start distributing as soon as you attach our standard copyleft to the files. (Ask for our advice on how to do this.)

The assignment contract we normally use has a clause that permits you to use your code in proprietary programs, on 30 days' notice. (The 30 days' notice is there because, through a legal technicality, it would improve our position in a suit against a hoarder.) Although we believe that proprietary software is wrong, we include this clause because it would serve no purpose to ask you to promise not to do it. You're giving us a gift in the first place.

You don't need to invoke this clause in order to distribute copies as free software under the GNU GPL, since everyone is allowed to do that.

* Releasing it yourself.

You can release a program yourself under copyleft distribution terms such as the GNU GPL. (In order to accept the program as GNU software, we would have to be happy with your choice of terms.) This does not require a contract between you and the FSF, but we would appreciate having a signed piece of paper to confirm your decision.

If someone violates your terms--for example, if someone gets a copy from us, and uses it as a basis for a proprietary product in violation of the terms--we cannot sue him. You would have to sue, or he gets away with it.

* Public domain.

If you put the program in the public domain, we prefer to have a signed piece of paper--a disclaimer of rights--from you confirming this. If the program is not very important, we can do without one; the worst that could happen is that we might some day be forced to stop using it.

The law says that anyone can copyright a modified version of the public domain work. (This doesn't restrict the original, which remains in the public domain; only the changes are copyrighted.) If we make extensive changes, we will probably do this and add our usual copyleft. If we make small changes, we will leave the version we distribute in the public domain.

* What about your employer?

If you are employed to do programming, or have made an agreement with your employer that says it owns programs you write, we need a signed piece of paper from your employer disclaiming rights to the program. It should be signed by a vice president or general manager of the company. If you can't get at them, it is almost as good to find someone who signs licenses for software that is purchased. Here is a sample wording:

Digital Simulation Corporation hereby disclaims all copyright interest in the program "sample.el" (a program to direct assemblers to make passes at compilers under GNU Emacs) written by Hugh Hacker.

<signature of Mo Ghoul>, 1 April 1987

Mo Ghoul, President of Vice, Digital Simulation Corp.

The description of what the program does is just to make it clearer what the disclaimer covers.

If what you did was change an existing program, it should say this:

...in the changes and enhancements made by Hugh Hacker to the program "sample.el".

* Did anyone else contribute?

If someone else contributed more than a few lines here or there to the program, then that person too is an author, and that person too needs to sign papers just as you do. So may that person's employer. However, if his contribution is just a fraction of the whole work, it is satisfactory if he disclaims his own rights, even if you are assigning yours. (If just the minor contributors' work goes in the public domain, that doesn't leave much of a loophole for hoarders.)

If you incorporated packages which you found floating around as "public domain", we might still want to track down their authors, to get disclaimers to reassure us that they really are in the public domain. So keep track of what these packages are and who wrote them.

* A reminder:

In working on a project for GNU, DO NOT study and follow any Unix sources or other non-free software that might have any bearing on the project. Don't refer to them at all, unless you are forced to for non-GNU reasons.

It is not considered a serious problem if you have read Unix sources

or other non-free source code in the past for other purposes, provided you don't copy anything in particular from them. However, referring to them while you do the work could cause us legal problems later.

Description:

Locating a program in PATH (LGPLed version).

Files:

lib/findprog.h

lib/findprog.c

lib/findprog-lgpl.c

m4/findprog.m4

m4/eaccess.m4

Depends-on:

stdbool

strdup

concat-filename

access

unistd

configure.ac:

gl_FINDPROG

gl_MODULE_INDICATOR([findprog-lgpl])

Makefile.am:

lib_SOURCES += findprog.h findprog.c

Include:

"findprog.h"

License:

LGPLv2+

Maintainer:

all

The files in this directory describe the gnu lib modules.

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Version 2, June 1991

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2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

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c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

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b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c) Accompany it with the information you received as to the offer

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```
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```

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```
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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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Version 2.1, February 1999

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Files:

tests/test-getcwd-lgpl.c

tests/signature.h

tests/macros.h

Depends-on:

configure.ac:

Makefile.am:

TESTS += test-getcwd-lgpl

check_PROGRAMS += test-getcwd-lgpl

test_getcwd_lgpl_LDADD = \$(LDADD) \$(LIBINTL)

Description:

realpath, canonicalize_file_name: Provide canonical absolute file name

Files:

lib/canonicalize-lgpl.c

m4/canonicalize.m4

m4/double-slash-root.m4

Depends-on:

extensions

stdlib

nocrash

alloca-opt [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

errno [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

lstat [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

malloca [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

memmove [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

pathmax [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

readlink [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

sys_stat [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1]

configure.ac:

gl_CANONICALIZE_LGPL

if test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1; then

```
AC_LIBOBJ([canonicalize-lgpl])
fi
gl_MODULE_INDICATOR([canonicalize-lgpl])
gl_STDLIB_MODULE_INDICATOR([canonicalize_file_name])
gl_STDLIB_MODULE_INDICATOR([realpath])
```

Makefile.am:

Include:
<stdlib.h>

License:
LGPLv2+

Maintainer:

all

Description:

Extract specific portions of filenames.

Files:

```
lib/dirname.h
lib/dirname-lgpl.c
lib/basename-lgpl.c
lib/stripslash.c
m4/dirname.m4
```

Depends-on:

```
dosname
double-slash-root
malloc-posix
stdbool
```

configure.ac:

```
gl_DIRNAME_LGPL
```

Makefile.am:

```
lib_SOURCES += dirname-lgpl.c basename-lgpl.c stripslash.c
```

Include:

```
"dirname.h"
```

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Maintainer:

Jim Meyering, Eric Blake

1.306 @tensorflow/tfjs-backend-webgl 3.11.0

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```

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* 605 E. Springfield, Champaign, IL 61820
* httpd@ncsa.uiuc.edu
*
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/* ZeusBench V1.01
 =====

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Written by Adam Twiss (adam@zeus.co.uk). March 1996

Thanks to the following people for their input:

Mike Belshe (mbelshe@netscape.com)

Michael Campanella (campanella@stevms.enet.dec.com)

*/

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
```

```
<html xmlns="http://www.w3.org/1999/xhtml" lang="en" xml:lang="en"><head>
```

```
<meta content="text/html; charset=ISO-8859-1" http-equiv="Content-Type" />
```

```
<!--
```

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
```

This file is generated from xml source: DO NOT EDIT

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
```

```
-->
```

```
<title>The Apache License, Version 2.0 - Apache HTTP Server Version 2.4</title>
```

```
<link href="/style/css/manual.css" rel="stylesheet" media="all" type="text/css" title="Main stylesheet" />
```

```
<link href="/style/css/manual-loose-100pc.css" rel="alternate stylesheet" media="all" type="text/css" title="No Sidebar - Default font size" />
```

```
<link href="/style/css/manual-print.css" rel="stylesheet" media="print" type="text/css" /><link rel="stylesheet" type="text/css" href="/style/css/prettify.css" />
```

```
<script src="/style/scripts/prettify.min.js" type="text/javascript">
```

```
</script>
```

```
<link href="/images/favicon.ico" rel="shortcut icon" /></head>
```

```
<body id="manual-page" class="no-sidebar"><div id="page-header">
```

```
<p class="menu"><a href="/mod/">Modules</a> | <a href="/mod/directives.html">Directives</a> | <a
```

```
href="http://wiki.apache.org/httpd/FAQ">FAQ</a> | <a href="/glossary.html">Glossary</a> | <a
```

```
href="/sitemap.html">Sitemap</a></p>
```

<p class="apache">Apache HTTP Server Version 2.4</p>
</div>
<div class="up"></div>
<div id="path">
Apache > HTTP Server > Documentation > Version 2.4</div><div id="page-content"><div id="preamble"><h1>The Apache License, Version 2.0</h1>
<div class="toplang">
<p>Available Languages: en </p></div>

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</div>

</div>

<div class="bottomlang">

<p>Available Languages: en </p>

</div><div class="top"></div><div

class="section"><h2>Comments</h2><div

class="warning">Notice:
This is not a Q&A section. Comments placed here should be

pointed towards suggestions on improving the documentation or server, and may be removed again by our

moderators if they are either implemented or considered invalid/off-topic. Questions on how to manage the Apache

HTTP Server should be directed at either our IRC channel, #httpd, on Freenode, or sent to our mailing lists</div>

<script type="text/javascript"><!--<!--><![CDATA[</><!--<!--

var comments_shortname = 'httpd';

var comments_identifier = 'http://httpd.apache.org/docs/2.4/license.html';

(function(w, d) {

if (w.location.hostname.toLowerCase() == "httpd.apache.org") {

d.write('<div id="comments_thread"></div>');

var s = d.createElement('script');

s.type = 'text/javascript';

s.async = true;

s.src = 'https://comments.apache.org/show_comments.lua?site=' + comments_shortname + '&page=' +

comments_identifier;

```

    (d.getElementsByTagName('head')[0] || d.getElementsByTagName('body')[0]).appendChild(s);
  }
  else {
    d.write('<div id="comments_thread">Comments are disabled for this page at the moment.</div>');
  }
})(window, document);
!--><![></script></div><div id="footer">
<p class="apache">Copyright 2019 The Apache Software Foundation.<br />Licensed under the <a
href="http://www.apache.org/licenses/LICENSE-2.0">Apache License, Version 2.0</a>.</p>
<p class="menu"><a href="/mod/">Modules</a> | <a href="/mod/directives.html">Directives</a> | <a
href="http://wiki.apache.org/httpd/FAQ">FAQ</a> | <a href="/glossary.html">Glossary</a> | <a
href="/sitemap.html">Sitemap</a></p></div><script type="text/javascript"><!--><![CDATA[</><!--
if (typeof(prettyPrint) !== 'undefined') {
  prettyPrint();
}
--><![></script>
</body></html>

```

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1.309 Ivm2 2.02.79

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/jsf/DelegatingPhaseListenerMulticaster.java

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/remoting/jaxws/JaxWsSoapFaultException.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/bind/annotation/InitBinder.java
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- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/client/InterceptingClientHttpRequestFactory.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/ZeroCopyHttpOutputMessage.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/method/annotation/ExpressionValueMethodArgumentResolver.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/client/reactive/JettyResourceFactory.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/remoting/jaxws/LocalJaxWsServiceFactory.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/jsf/DelegatingNavigationHandlerProxy.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/context/request/FacesRequestAttributes.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/codec/HttpMessageDecoder.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/context/support/AbstractRefreshableWebApplicationContext.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/context/ServletConfigAware.java
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- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/method/annotation/InitBinderDataBinderFactory.java
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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
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- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/bind/support/WebBindingInitializer.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/cors/reactive/CorsConfigurationSource.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-

jar/org/springframework/web/bind/annotation/PatchMapping.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/bind/annotation/PutMapping.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/WebApplicationContext.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/request/FacesWebRequest.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/remoting/httpinvoker/HttpInvokerRequestExecutor.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/annotation/ApplicationScope.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/bind/annotation/GetMapping.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/server/session/WebSessionManager.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/converter/json/SpringHandlerInstantiator.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/bind/annotation/PostMapping.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/filter/CompositeFilter.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/bind/annotation/SessionAttribute.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/server/WebHandler.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/request/async/AsyncRequestTimeoutException.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/ReactiveHttpOutputMessage.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/server/session/WebSessionIdResolver.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/cors/CorsConfigurationSource.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/support/ServletContextLiveBeansView.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/bind/annotation/CookieValue.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/server/WebExceptionHandler.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/multipart/MultipartRequest.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/ReactiveHttpInputMessage.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/annotation/SessionScope.java
No license file was found, but licenses were detected in source scan.

This file maps Internet media types to unique file extension(s).

```

# Although created for httpd, this file is used by many software systems
# and has been placed in the public domain for unlimited redistribution.
#
# The table below contains both registered and (common) unregistered types.
# A type that has no unique extension can be ignored -- they are listed
# here to guide configurations toward known types and to make it easier to
# identify "new" types. File extensions are also commonly used to indicate
# content languages and encodings, so choose them carefully.
#
# Internet media types should be registered as described in RFC 4288.
# The registry is at <https://www.iana.org/assignments/media-types/>.
#
# This file was retrieved from
https://svn.apache.org/viewvc/httpd/httpd/trunk/docs/conf/mime.types?revision=1752884&view=co
#
# MIME type (lowercased) Extensions
# =====
# application/1d-interleaved-parityfec
# application/3gpdash-qoe-report+xml
# application/3gpp-ims+xml
# application/a2l
# application/activemessage
# application/alto-costmap+json
# application/alto-costmapfilter+json
# application/alto-directory+json
# application/alto-endpointcost+json
# application/alto-endpointcostparams+json
# application/alto-endpointprop+json
# application/alto-endpointpropparams+json
# application/alto-error+json
# application/alto-networkmap+json
# application/alto-networkmapfilter+json
# application/aml
application/andrew-inset ez
# application/applefile
application/applixware aw
# application/atf
# application/atfx
application/atom+xml atom
application/atomcat+xml atomcat
# application/atomdeleted+xml
# application/atomicmail
application/atomsvc+xml atomsvc
# application/atxml
# application/auth-policy+xml
# application/bacnet-xdd+zip
# application/batch-smtp
# application/beep+xml

```

application/calendar+json
application/calendar+xml
application/call-completion
application/cals-1840
application/cbor
application/ccmp+xml
application/ccxml+xml ccxml
application/cdfx+xml
application/cdmi-capability cdmia
application/cdmi-container cdmic
application/cdmi-domain cdmid
application/cdmi-object cdmio
application/cdmi-queue cdmiq
application/cdni
application/cea
application/cea-2018+xml
application/cellml+xml
application/cfw
application/cms
application/cnrx+xml
application/coap-group+json
application/commonground
application/conference-info+xml
application/cpl+xml
application/csrattrs
application/csta+xml
application/cstadata+xml
application/csvm+json
application/cu-seeme cu
application/cybercash
application/dash+xml
application/dashdelta
application/davmount+xml davmount
application/dca-rft
application/dcd
application/dec-dx
application/dialog-info+xml
application/dicom
application/dii
application/dit
application/dns
application/docbook+xml dbk
application/dskpp+xml
application/dssc+der dssc
application/dssc+xml xdssc
application/dvcs
application/ecmascript ecma
application/edi-consent

application/edi-x12
application/edifact
application/efi
application/emergencycalldata.comment+xml
application/emergencycalldata.deviceinfo+xml
application/emergencycalldata.providerinfo+xml
application/emergencycalldata.serviceinfo+xml
application/emergencycalldata.subscriberinfo+xml
application/emma+xml emma
application/emotionml+xml
application/encaprtp
application/epp+xml
application/epub+zip epub
application/eshop
application/example
application/exi exi
application/fastinfoset
application/fastsoap
application/fdt+xml
application/fits
application/font-sfnt
application/font-tdpfr pfr
application/font-woff woff
application/framework-attributes+xml
application/geo+json
application/gml+xml gml
application/gpx+xml gpx
application/gxf gxf
application/gzip
application/h224
application/held+xml
application/http
application/hyperstudio stk
application/ibe-key-request+xml
application/ibe-pkg-reply+xml
application/ibe-pp-data
application/iges
application/im-iscomposing+xml
application/index
application/index.cmd
application/index.obj
application/index.response
application/index.vnd
application/inkml+xml ink inkml
application/iotp
application/ipfix ipfix
application/ipp
application/isup

application/its+xml
application/java-archive jar
application/java-serialized-object ser
application/java-vm class
application/javascript js
application/jose
application/jose+json
application/jrd+json
application/json json
application/json-patch+json
application/json-seq
application/jsonml+json jsonml
application/jwk+json
application/jwk-set+json
application/jwt
application/kpml-request+xml
application/kpml-response+xml
application/ld+json
application/lgr+xml
application/link-format
application/load-control+xml
application/lost+xml lostxml
application/lostsync+xml
application/lxf
application/mac-binhex40 hqx
application/mac-compactpro cpt
application/macwriteii
application/mads+xml mads
application/marc mrc
application/marcxml+xml mrcx
application/mathematica ma nb mb
application/mathml+xml mathml
application/mathml-content+xml
application/mathml-presentation+xml
application/mbms-associated-procedure-description+xml
application/mbms-deregister+xml
application/mbms-envelope+xml
application/mbms-msk+xml
application/mbms-msk-response+xml
application/mbms-protection-description+xml
application/mbms-reception-report+xml
application/mbms-register+xml
application/mbms-register-response+xml
application/mbms-schedule+xml
application/mbms-user-service-description+xml
application/mbox mbox
application/media-policy-dataset+xml
application/media_control+xml

application/mediaservercontrol+xml mscml
application/merge-patch+json
application/metalink+xml metalink
application/metalink4+xml meta4
application/mets+xml mets
application/mf4
application/mikey
application/mods+xml mods
application/moss-keys
application/moss-signature
application/mosskey-data
application/mosskey-request
application/mp21 m21 mp21
application/mp4 mp4s
application/mpeg4-generic
application/mpeg4-iod
application/mpeg4-iod-xmt
application/mrb-consumer+xml
application/mrb-publish+xml
application/msc-ivr+xml
application/msc-mixer+xml
application/msword doc dot
application/mxf mxf
application/nasdata
application/news-checkgroups
application/news-groupinfo
application/news-transmission
application/nlsm1+xml
application/nss
application/ocsp-request
application/ocsp-response
application/octet-stream bin dms lrf mar so dist distz pkg bpk dump elc deploy
application/oda oda
application/odx
application/oebps-package+xml opf
application/ogg ogx
application/omdoc+xml omdoc
application/onenote onetoc onetoc2 onetmp onepkg
application/oxps oxps
application/p2p-overlay+xml
application/parityfec
application/patch-ops-error+xml xer
application/pdf pdf
application/pdx
application/pgp-encrypted pgp
application/pgp-keys
application/pgp-signature asc sig
application/pics-rules prf

application/pidf+xml
application/pidf-diff+xml
application/pkcs10 p10
application/pkcs12
application/pkcs7-mime p7m p7c
application/pkcs7-signature p7s
application/pkcs8 p8
application/pkix-attr-cert ac
application/pkix-cert cer
application/pkix-crl crl
application/pkix-pkipath pkipath
application/pkixcmp pki
application/pls+xml pls
application/poc-settings+xml
application/postscript ai eps ps
application/ppsp-tracker+json
application/problem+json
application/problem+xml
application/provenance+xml
application/prs.alvestrand.titrax-sheet
application/prs.cww cww
application/prs.hpub+zip
application/prs.nprend
application/prs.plucker
application/prs.rdf+xml-crypt
application/prs.xsf+xml
application/pskc+xml pskcxml
application/qsig
application/raptorfec
application/rdap+json
application/rdf+xml rdf
application/reginfo+xml rif
application/relax-ng-compact-syntax rnc
application/remote-printing
application/reputon+json
application/resource-lists+xml rl
application/resource-lists-diff+xml rld
application/rfc+xml
application/riscos
application/rlmi+xml
application/rls-services+xml rs
application/rpki-ghostbusters gbr
application/rpki-manifest mft
application/rpki-roa roa
application/rpki-updown
application/rsd+xml rsd
application/rss+xml rss
application/rtf rtf

application/rtploopback
application/rtx
application/samlassertion+xml
application/samlmetadata+xml
application/sbml+xml sbml
application/scaip+xml
application/scim+json
application/scvp-cv-request scq
application/scvp-cv-response scs
application/scvp-vp-request spq
application/scvp-vp-response spp
application/sdp sdp
application/sep+xml
application/sep-exi
application/session-info
application/set-payment
application/set-payment-initiation setpay
application/set-registration
application/set-registration-initiation setreg
application/sgml
application/sgml-open-catalog
application/shf+xml shf
application/sieve
application/simple-filter+xml
application/simple-message-summary
application/simplesymbolcontainer
application/slate
application/smil
application/smil+xml smi smil
application/smpte336m
application/soap+fastinfoset
application/soap+xml
application/sparql-query rq
application/sparql-results+xml srx
application/spirits-event+xml
application/sql
application/srgs gram
application/srgs+xml grxml
application/sru+xml sru
application/ssdl+xml ssdl
application/ssml+xml ssml
application/tamp-apex-update
application/tamp-apex-update-confirm
application/tamp-community-update
application/tamp-community-update-confirm
application/tamp-error
application/tamp-sequence-adjust
application/tamp-sequence-adjust-confirm

application/tamp-status-query
application/tamp-status-response
application/tamp-update
application/tamp-update-confirm
application/tei+xml tei teicorpus
application/thraud+xml tfi
application/timestamp-query
application/timestamp-reply
application/timestamped-data tsd
application/ttml+xml
application/tve-trigger
application/ulpfec
application/urc-grpsheet+xml
application/urc-ressheet+xml
application/urc-targetdesc+xml
application/urc-uisocketdesc+xml
application/vcard+json
application/vcard+xml
application/vemmi
application/vividence.scriptfile
application/vnd.3gpp-prose+xml
application/vnd.3gpp-prose-pc3ch+xml
application/vnd.3gpp.access-transfer-events+xml
application/vnd.3gpp.bsf+xml
application/vnd.3gpp.mid-call+xml
application/vnd.3gpp.pic-bw-large plb
application/vnd.3gpp.pic-bw-small psb
application/vnd.3gpp.pic-bw-var pvb
application/vnd.3gpp.sms
application/vnd.3gpp.sms+xml
application/vnd.3gpp.srvcc-ext+xml
application/vnd.3gpp.srvcc-info+xml
application/vnd.3gpp.state-and-event-info+xml
application/vnd.3gpp.ussd+xml
application/vnd.3gpp2.bcmcsinfo+xml
application/vnd.3gpp2.sms
application/vnd.3gpp2.tcap tcap
application/vnd.3lightssoftware.imagescal
application/vnd.3m.post-it-notes pwn
application/vnd.accpac.simply.aso aso
application/vnd.accpac.simply.imp imp
application/vnd.acucobol acu
application/vnd.acucorp atc acutc
application/vnd.adobe.air-application-installer-package+zip air
application/vnd.adobe.flash.movie
application/vnd.adobe.formscentral.fcdt fcdt
application/vnd.adobe.fxp fxp fxpl
application/vnd.adobe.partial-upload

application/vnd.adobe.xdp+xml xdp
application/vnd.adobe.xfdf xfdf
application/vnd.aether.imp
application/vnd.ah-barcode
application/vnd.ahead.space ahead
application/vnd.airzip.filesecure.azf azf
application/vnd.airzip.filesecure.azs azs
application/vnd.amazon.ebook azw
application/vnd.amazon.mobi8-ebook
application/vnd.americandynamics.acc acc
application/vnd.amiga.ami ami
application/vnd.amundsen.maze+xml
application/vnd.android.package-archive apk
application/vnd.anki
application/vnd.anser-web-certificate-issue-initiation cii
application/vnd.anser-web-funds-transfer-initiation fti
application/vnd.antix.game-component atx
application/vnd.apache.thrift.binary
application/vnd.apache.thrift.compact
application/vnd.apache.thrift.json
application/vnd.api+json
application/vnd.apple.installer+xml mpkg
application/vnd.apple.mpegurl m3u8
application/vnd.arastra.swi
application/vnd.aristanetworks.swi swi
application/vnd.artsquare
application/vnd.astraea-software.iota iota
application/vnd.audiograph aep
application/vnd.autopackage
application/vnd.avistar+xml
application/vnd.balsamiq.bmml+xml
application/vnd.balsamiq.bmpr
application/vnd.bekitzur-stech+json
application/vnd.biopax.rdf+xml
application/vnd.blueice.multipass mpm
application/vnd.bluetooth.ep.oob
application/vnd.bluetooth.le.oob
application/vnd.bmi bmi
application/vnd.businessobjects rep
application/vnd.cab-jscript
application/vnd.canon-cpdl
application/vnd.canon-lips
application/vnd.cendio.thinlinc.clientconf
application/vnd.century-systems.tcp_stream
application/vnd.chemdraw+xml cdxml
application/vnd.chess-pgn
application/vnd.chipnuts.karaoke-mmd mmd
application/vnd.cinderella cdy

```
# application/vnd.cirpack.isdn-ext
# application/vnd.citationstyles.style+xml
application/vnd.claymore cla
application/vnd.cloanto.rp9 rp9
application/vnd.clonk.c4group c4g c4d c4f c4p c4u
application/vnd.cluetrust.cartomobile-config c11amc
application/vnd.cluetrust.cartomobile-config-pkg c11amz
# application/vnd.coffeescript
# application/vnd.collection+json
# application/vnd.collection.doc+json
# application/vnd.collection.next+json
# application/vnd.comicbook+zip
# application/vnd.commerce-battelle
application/vnd.commonspace csp
application/vnd.contact.cmsg cdbcmsg
# application/vnd.coreos.ignition+json
application/vnd.cosmocaller cmc
application/vnd.crick.clicker clkx
application/vnd.crick.clicker.keyboard clkk
application/vnd.crick.clicker.palette clkp
application/vnd.crick.clicker.template clkt
application/vnd.crick.clicker.wordbank clkw
application/vnd.criticaltools.wbs+xml wbs
application/vnd.ctc-posml pml
# application/vnd.ctct.ws+xml
# application/vnd.cups-pdf
# application/vnd.cups-postscript
application/vnd.cups-ppd ppd
# application/vnd.cups-raster
# application/vnd.cups-raw
# application/vnd.curl
application/vnd.curl.car car
application/vnd.curl.pcurl pcurl
# application/vnd.cyan.dean.root+xml
# application/vnd.cybank
application/vnd.dart dart
application/vnd.data-vision.rdz rdz
# application/vnd.debian.binary-package
application/vnd.dece.data uvf uvvf uvd uvvd
application/vnd.dece.ttml+xml uvt uvvt
application/vnd.dece.unspecified uvx uvvx
application/vnd.dece.zip uvz uvvz
application/vnd.denovo.fcselayout-link fe_launch
# application/vnd.desmume.movie
# application/vnd.dir-bi.plate-dl-nosuffix
# application/vnd.dm.delegation+xml
application/vnd.dna dna
# application/vnd.document+json
```

application/vnd.dolby.mlp mlp
application/vnd.dolby.mobile.1
application/vnd.dolby.mobile.2
application/vnd.doremir.scorecloud-binary-document
application/vnd.dpgraph dpg
application/vnd.dreamfactory dfac
application/vnd.drive+json
application/vnd.ds-keypoint kpxx
application/vnd.dtg.local
application/vnd.dtg.local.flash
application/vnd.dtg.local.html
application/vnd.dvb.ait ait
application/vnd.dvb.dvbj
application/vnd.dvb.esgcontainer
application/vnd.dvb.ipdcdfnotifaccess
application/vnd.dvb.ipdcesgaccess
application/vnd.dvb.ipdcesgaccess2
application/vnd.dvb.ipdcesgpdd
application/vnd.dvb.ipdcroaming
application/vnd.dvb.iptv.alfec-base
application/vnd.dvb.iptv.alfec-enhancement
application/vnd.dvb.notif-aggregate-root+xml
application/vnd.dvb.notif-container+xml
application/vnd.dvb.notif-generic+xml
application/vnd.dvb.notif-ia-msglist+xml
application/vnd.dvb.notif-ia-registration-request+xml
application/vnd.dvb.notif-ia-registration-response+xml
application/vnd.dvb.notif-init+xml
application/vnd.dvb.pfr
application/vnd.dvb.service svc
application/vnd.dxr
application/vnd.dynageo geo
application/vnd.dzr
application/vnd.easykaraoke.cdgdownload
application/vnd.ecdis-update
application/vnd.ecowin.chart mag
application/vnd.ecowin.filerequest
application/vnd.ecowin.fileupdate
application/vnd.ecowin.series
application/vnd.ecowin.seriesrequest
application/vnd.ecowin.seriesupdate
application/vnd.emclient.accessrequest+xml
application/vnd.enliven nml
application/vnd.enphase.envoy
application/vnd.eprints.data+xml
application/vnd.epson.esf esf
application/vnd.epson.msf msf
application/vnd.epson.quickanime qam

application/vnd.epson.salt slt
application/vnd.epson.ssf ssf
application/vnd.ericsson.quickcall
application/vnd.eszigno3+xml es3 et3
application/vnd.etsi.aoc+xml
application/vnd.etsi.asic-e+zip
application/vnd.etsi.asic-s+zip
application/vnd.etsi.cug+xml
application/vnd.etsi.iptvcommand+xml
application/vnd.etsi.iptvdiscovery+xml
application/vnd.etsi.iptvprofile+xml
application/vnd.etsi.iptvsad-bc+xml
application/vnd.etsi.iptvsad-cod+xml
application/vnd.etsi.iptvsad-npvr+xml
application/vnd.etsi.iptvservice+xml
application/vnd.etsi.iptvsync+xml
application/vnd.etsi.iptvueprofile+xml
application/vnd.etsi.mcid+xml
application/vnd.etsi.mheg5
application/vnd.etsi.overload-control-policy-dataset+xml
application/vnd.etsi.pstn+xml
application/vnd.etsi.sci+xml
application/vnd.etsi.simservs+xml
application/vnd.etsi.timestamp-token
application/vnd.etsi.tsl+xml
application/vnd.etsi.tsl.der
application/vnd.eudora.data
application/vnd.ezpix-album ez2
application/vnd.ezpix-package ez3
application/vnd.f-secure.mobile
application/vnd.fastcopy-disk-image
application/vnd.fdf fdf
application/vnd.fdsn.mseed mseed
application/vnd.fdsn.seed seed dataless
application/vnd.ffmpeg
application/vnd.filmit.zfc
application/vnd.fints
application/vnd.firemonkeys.cloudcell
application/vnd.flographit gph
application/vnd.fluxtime.clip ftc
application/vnd.font-fontforge-sfd
application/vnd.frame-maker fm frame maker book
application/vnd.frogans.fnc fnc
application/vnd.frogans.ltf ltf
application/vnd.fsc.weblaunch fsc
application/vnd.fujitsu.oasys oas
application/vnd.fujitsu.oasys2 oa2
application/vnd.fujitsu.oasys3 oa3

application/vnd.fujitsu.oasysgp fg5
application/vnd.fujitsu.oasysprs bh2
application/vnd.fujixerox.art-ex
application/vnd.fujixerox.art4
application/vnd.fujixerox.ddd ddd
application/vnd.fujixerox.docuworks xdw
application/vnd.fujixerox.docuworks.binder xbd
application/vnd.fujixerox.docuworks.container
application/vnd.fujixerox.hbpl
application/vnd.fut-misnet
application/vnd.fuzzysheet fzs
application/vnd.genomatix.tuxedo txd
application/vnd.geo+json
application/vnd.geocube+xml
application/vnd.geogebra.file ggb
application/vnd.geogebra.tool ggt
application/vnd.geometry-explorer gex gre
application/vnd.geonext gxt
application/vnd.geoplan g2w
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application/vnd.gridmp
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application/vnd.groove-help ghf
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application/vnd.groove-injector grv
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application/vnd.hal+xml hal
application/vnd.handheld-entertainment+xml zmm
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application/vnd.hcl-bireports
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application/vnd.hp-hpgl hpgl
application/vnd.hp-hpid hpid

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application/vnd.intergeo i2g
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application/vnd.lotus-freelance pre
application/vnd.lotus-notes nsf
application/vnd.lotus-organizer org
application/vnd.lotus-screencam scm
application/vnd.lotus-wordpro lwp
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application/vnd.mason+json

```
# application/vnd.maxmind.maxmind-db
application/vnd.mcd mcd
application/vnd.medcalldata mc1
application/vnd.mediatation.cdkey cdkey
# application/vnd.meridian-slideshow
application/vnd.mfer mwf
application/vnd.mfmp mfm
# application/vnd.micro+json
application/vnd.microgfx.flo flo
application/vnd.microgfx.igx igx
# application/vnd.microsoft.portable-executable
# application/vnd.miele+json
application/vnd.mif mif
# application/vnd.minisoft-hp3000-save
# application/vnd.mitsubishi.misty-guard.trustweb
application/vnd.mobius.daf daf
application/vnd.mobius.dis dis
application/vnd.mobius.mbk mbk
application/vnd.mobius.mqy mqy
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application/vnd.mophun.application mpn
application/vnd.mophun.certificate mpc
# application/vnd.motorola.flexsuite
# application/vnd.motorola.flexsuite.adi
# application/vnd.motorola.flexsuite.fis
# application/vnd.motorola.flexsuite.gotap
# application/vnd.motorola.flexsuite.kmr
# application/vnd.motorola.flexsuite.ttc
# application/vnd.motorola.flexsuite.wem
# application/vnd.motorola.iprm
application/vnd.mozilla.xul+xml xul
# application/vnd.ms-3mfdocument
application/vnd.ms-artgalry cil
# application/vnd.ms-asf
application/vnd.ms-cab-compressed cab
# application/vnd.ms-color.iccprofile
application/vnd.ms-excel xls xlm xla xlc xlt xlw
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application/vnd.ms-excel.template.macroenabled.12 xltn
application/vnd.ms-fontobject eot
application/vnd.ms-htmlhelp chm
application/vnd.ms-ims ims
application/vnd.ms-lrm lrm
# application/vnd.ms-office.activex+xml
```

application/vnd.ms-officetheme thmx
application/vnd.ms-opentype
application/vnd.ms-package.obfuscated-opentype
application/vnd.ms-pki.seccat cat
application/vnd.ms-pki.stl stl
application/vnd.ms-playready.initiator+xml
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application/vnd.ms-printschematicket+xml
application/vnd.ms-project mpp mpt
application/vnd.ms-tnef
application/vnd.ms-windows.devicepairing
application/vnd.ms-windows.nwprinting.oob
application/vnd.ms-windows.printerpairing
application/vnd.ms-windows.wsd.oob
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application/vnd.noblenet-sealer nns
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application/vnd.nokia.iptv.config+xml
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application/vnd.nokia.radio-presets rpss
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application/vnd.ntt-local.file-transfer
application/vnd.ntt-local.ogw_remote-access
application/vnd.ntt-local.sip-ta_remote
application/vnd.ntt-local.sip-ta_tcp_stream
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application/vnd.oasis.opendocument.presentation-template otp
application/vnd.oasis.opendocument.spreadsheet ods
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application/vnd.oma.poc.final-report+xml
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application/vnd.ubisoft.webplayer
application/vnd.ufdl ufd ufdl
application/vnd.uiq.theme utz
application/vnd.umajin umj
application/vnd.unity unityweb
application/vnd.uoml+xml uoml
application/vnd.uplanet.alert
application/vnd.uplanet.alert-wbxml
application/vnd.uplanet.bearer-choice
application/vnd.uplanet.bearer-choice-wbxml
application/vnd.uplanet.cacheop
application/vnd.uplanet.cacheop-wbxml

application/vnd.uplanet.channel
application/vnd.uplanet.channel-wbxml
application/vnd.uplanet.list
application/vnd.uplanet.list-wbxml
application/vnd.uplanet.listcmd
application/vnd.uplanet.listcmd-wbxml
application/vnd.uplanet.signal
application/vnd.uri-map
application/vnd.valve.source.material
application/vnd.vcx vcx
application/vnd.vd-study
application/vnd.vectorworks
application/vnd.vel+json
application/vnd.verimatrix.vcas
application/vnd.vidsoft.vidconference
application/vnd.visio vsd vst vss vsw
application/vnd.visionary vis
application/vnd.vividence.scriptfile
application/vnd.vsf vsf
application/vnd.wap.sic
application/vnd.wap.slc
application/vnd.wap.wbxml wbxml
application/vnd.wap.wmlc wmlc
application/vnd.wap.wmlscriptc wmlsc
application/vnd.webturbo wtb
application/vnd.wfa.p2p
application/vnd.wfa.wsc
application/vnd.windows.devicepairing
application/vnd.wmc
application/vnd.wmf.bootstrap
application/vnd.wolfram.mathematica
application/vnd.wolfram.mathematica.package
application/vnd.wolfram.player nbp
application/vnd.wordperfect wpd
application/vnd.wqd wqd
application/vnd.wrq-hp3000-labelled
application/vnd.wt.stf stf
application/vnd.wv.csp+wbxml
application/vnd.wv.csp+xml
application/vnd.wv.ssp+xml
application/vnd.xacml+json
application/vnd.xara xar
application/vnd.xfdl xfdl
application/vnd.xfdl.webform
application/vnd.xmi+xml
application/vnd.xmpie.cpkg
application/vnd.xmpie.dpkg
application/vnd.xmpie.plan

```
# application/vnd.xmpie.ppkg
# application/vnd.xmpie.xlim
application/vnd.yamaha.hv-dic hvd
application/vnd.yamaha.hv-script hvs
application/vnd.yamaha.hv-voice hvp
application/vnd.yamaha.openscoreformat osf
application/vnd.yamaha.openscoreformat.osfpvg+xml osfpvg
# application/vnd.yamaha.remote-setup
application/vnd.yamaha.smaf-audio saf
application/vnd.yamaha.smaf-phrase spf
# application/vnd.yamaha.through-ngn
# application/vnd.yamaha.tunnel-udpencap
# application/vnd.yaoweme
application/vnd.yellowriver-custom-menu cmp
application/vnd.zul zir zirz
application/vnd.zzazz.deck+xml zaz
application/voicexml+xml vxml
# application/vq-rtpcpxr
# application/watcherinfo+xml
# application/whoispp-query
# application/whoispp-response
application/widget wgt
application/winhelp hlp
# application/wita
# application/wordperfect5.1
application/wsdl+xml wsdl
application/wspolicy+xml wspolicy
application/x-7z-compressed 7z
application/x-abiword abw
application/x-ace-compressed ace
# application/x-amf
application/x-apple-diskimage dmg
application/x-authorware-bin aab x32 u32 vox
application/x-authorware-map aam
application/x-authorware-seg aas
application/x-bcpio bcpio
application/x-bittorrent torrent
application/x-blorb blb blorb
application/x-bzip bz
application/x-bzip2 bz2 boz
application/x-cbr cbr cba cbt cbz cb7
application/x-cdlink vcd
application/x-cfs-compressed cfs
application/x-chat chat
application/x-chess-pgn pgn
# application/x-compress
application/x-conference nsc
application/x-cpio cpio
```

application/x-csh csh
application/x-debian-package deb udeb
application/x-dgc-compressed dgc
application/x-director dir dcr dxr cst cct cxt w3d fgd swa
application/x-doom wad
application/x-dtbncx+xml ncx
application/x-dtbook+xml dtb
application/x-dtbresource+xml res
application/x-dvi dvi
application/x-envoy evy
application/x-eva eva
application/x-font-bdf bdf
application/x-font-dos
application/x-font-framemaker
application/x-font-ghostscript gsf
application/x-font-libgrx
application/x-font-linux-psf psf
application/x-font-otf otf
application/x-font-pcf pcf
application/x-font-snf snf
application/x-font-speedo
application/x-font-sunos-news
application/x-font-ttf ttf ttc
application/x-font-type1 pfa pfb pfm afm
application/x-font-vfont
application/x-freearc arc
application/x-futuresplash spl
application/x-gca-compressed gca
application/x-glulx ulx
application/x-gnumeric gnumeric
application/x-gramps-xml gramps
application/x-gtar gtar
application/x-gzip
application/x-hdf hdf
application/x-install-instructions install
application/x-iso9660-image iso
application/x-java-jnlp-file jnlp
application/x-latex latex
application/x-lzh-compressed lzh lha
application/x-mie mie
application/x-mobipocket-ebook prc mobi
application/x-ms-application application
application/x-ms-shortcut lnk
application/x-ms-wmd wmd
application/x-ms-wmz wmz
application/x-ms-xbap xbap
application/x-msaccess mdb
application/x-msbinder obd

application/x-mscardfile crd
application/x-msclip clp
application/x-msdownload exe dll com bat msi
application/x-msmediaview mvb m13 m14
application/x-msmetafile wmf wmz emf emz
application/x-msmoney mny
application/x-mspublisher pub
application/x-msschedule scd
application/x-msterminal trm
application/x-mswrite wri
application/x-netcdf nc cdf
application/x-nzb nzb
application/x-pkcs12 p12 pfx
application/x-pkcs7-certificates p7b spc
application/x-pkcs7-certreqresp p7r
application/x-rar-compressed rar
application/x-research-info-systems ris
application/x-sh sh
application/x-shar shar
application/x-shockwave-flash swf
application/x-silverlight-app xap
application/x-sql sql
application/x-stuffit sit
application/x-stuffitx sitx
application/x-subrip srt
application/x-sv4cpio sv4cpio
application/x-sv4crc sv4crc
application/x-t3vm-image t3
application/x-tads gam
application/x-tar tar
application/x-tcl tcl
application/x-tex tex
application/x-tex-tfm tfm
application/x-texinfo texinfo texi
application/x-tgif obj
application/x-ustar ustar
application/x-wais-source src
application/x-www-form-urlencoded
application/x-x509-ca-cert der crt
application/x-xfig fig
application/x-xliff+xml xlf
application/x-xpinstall xpi
application/x-xz xz
application/x-zmachine z1 z2 z3 z4 z5 z6 z7 z8
application/x400-bp
application/xacml+xml
application/xaml+xml xaml
application/xcap-att+xml

```
# application/xcap-caps+xml
application/xcap-diff+xml xdf
# application/xcap-el+xml
# application/xcap-error+xml
# application/xcap-ns+xml
# application/xcon-conference-info+xml
# application/xcon-conference-info-diff+xml
application/xenc+xml xenc
application/xhtml+xml xhtml xht
# application/xhtml-voice+xml
application/xml xml xsl
application/xml-dtd dtd
# application/xml-external-parsed-entity
# application/xml-patch+xml
# application/xmpp+xml
application/xop+xml xop
application/xproc+xml xpl
application/xslt+xml xslt
application/xspf+xml xspf
application/xv+xml mxml xhvmml xvml xvm
application/yang yang
application/yin+xml yin
application/zip zip
# application/zlib
# audio/1d-interleaved-parityfec
# audio/32kadpcm
# audio/3gpp
# audio/3gpp2
# audio/ac3
audio/adpcm adp
# audio/amr
# audio/amr-wb
# audio/amr-wb+
# audio/aptx
# audio/asc
# audio/atrac-advanced-lossless
# audio/atrac-x
# audio/atrac3
audio/basic au snd
# audio/bv16
# audio/bv32
# audio/clearmode
# audio/cn
# audio/dat12
# audio/dls
# audio/dsr-es201108
# audio/dsr-es202050
# audio/dsr-es202211
```


audio/dsr-es202212
audio/dv
audio/dvi4
audio/eac3
audio/encaprtsp
audio/evrc
audio/evrc-qcp
audio/evrc0
audio/evrc1
audio/evrcb
audio/evrcb0
audio/evrcb1
audio/evrcnw
audio/evrcnw0
audio/evrcnw1
audio/evrcwb
audio/evrcwb0
audio/evrcwb1
audio/evs
audio/example
audio/fwdred
audio/g711-0
audio/g719
audio/g722
audio/g7221
audio/g723
audio/g726-16
audio/g726-24
audio/g726-32
audio/g726-40
audio/g728
audio/g729
audio/g7291
audio/g729d
audio/g729e
audio/gsm
audio/gsm-efr
audio/gsm-hr-08
audio/ilbc
audio/ip-mr_v2.5
audio/isac
audio/l16
audio/l20
audio/l24
audio/l8
audio/lpc
audio/midi mid midi kar rmi
audio/mobile-xmf

audio/mp4 m4a mp4a
audio/mp4a-latm
audio/mpa
audio/mpa-robust
audio/mpeg mpga mp2 mp2a mp3 m2a m3a
audio/mpeg4-generic
audio/musepack
audio/ogg oga ogg spx
audio/opus
audio/parityfec
audio/pcma
audio/pcma-wb
audio/pcmu
audio/pcmu-wb
audio/prs.sid
audio/qcelp
audio/raptorfec
audio/red
audio/rtp-enc-aescm128
audio/rtp-midi
audio/rtploopback
audio/rtx
audio/s3m s3m
audio/silk sil
audio/smv
audio/smv-qcp
audio/smv0
audio/sp-midi
audio/speex
audio/t140c
audio/t38
audio/telephone-event
audio/tone
audio/uemclip
audio/ulpfec
audio/vdvi
audio/vmr-wb
audio/vnd.3gpp.iufp
audio/vnd.4sb
audio/vnd.audiokoz
audio/vnd.celp
audio/vnd.cisco.nse
audio/vnd.cmles.radio-events
audio/vnd.cns.anp1
audio/vnd.cns.inf1
audio/vnd.dece.audio uva uvva
audio/vnd.digital-winds eol
audio/vnd.dlna.adts

audio/vnd.dolby.heaac.1
audio/vnd.dolby.heaac.2
audio/vnd.dolby.mlp
audio/vnd.dolby.mps
audio/vnd.dolby.pl2
audio/vnd.dolby.pl2x
audio/vnd.dolby.pl2z
audio/vnd.dolby.pulse.1
audio/vnd.dra dra
audio/vnd.dts dts
audio/vnd.dts.hd dtshd
audio/vnd.dvb.file
audio/vnd.everad.plj
audio/vnd.hns.audio
audio/vnd.lucent.voice lvp
audio/vnd.ms-playready.media.pya pya
audio/vnd.nokia.mobile-xmf
audio/vnd.nortel.vbk
audio/vnd.nuera.ecelp4800 ecelp4800
audio/vnd.nuera.ecelp7470 ecelp7470
audio/vnd.nuera.ecelp9600 ecelp9600
audio/vnd.octel.sbc
audio/vnd.qcelp
audio/vnd.rhetorex.32kadpcm
audio/vnd.rip rip
audio/vnd.sealedmedia.softseal.mpeg
audio/vnd.vmx.cvsd
audio/vorbis
audio/vorbis-config
audio/webm weba
audio/x-aac aac
audio/x-aiff aif aiff aifc
audio/x-caf caf
audio/x-flac flac
audio/x-matroska mka
audio/x-mpegurl m3u
audio/x-ms-wax wax
audio/x-ms-wma wma
audio/x-pn-realaudio ram ra
audio/x-pn-realaudio-plugin rmp
audio/x-tta
audio/x-wav wav
audio/xm xm
chemical/x-cdx cdx
chemical/x-cif cif
chemical/x-cmdf cmdf
chemical/x-cml cml
chemical/x-csml csml

```
# chemical/x-pdb
chemical/x-xyz xyz
image/bmp bmp
image/cgm cgm
# image/dicom-rlc
# image/emf
# image/example
# image/fits
image/g3fax g3
image/gif gif
image/ief ief
# image/jls
# image/jp2
image/jpeg jpeg jpg jpe
# image/jpm
# image/jpx
image/ktx ktx
# image/naplps
image/png png
image/prs.btif btif
# image/prs.pti
# image/pwg-raster
image/sgi sgi
image/svg+xml svg svgz
# image/t38
image/tiff tiff tif
# image/tiff-fx
image/vnd.adobe.photoshop psd
# image/vnd.airzip.accelerator.azv
# image/vnd.cns.inf2
image/vnd.dece.graphic uvi uvvi uvg uvvg
image/vnd.djvu djvu djv
image/vnd.dvb.subtitle sub
image/vnd.dwg dwg
image/vnd.dxf dxf
image/vnd.fastbidsheet fbs
image/vnd.fpx fpx
image/vnd.fst fst
image/vnd.fujixerox.edmics-mmr mmr
image/vnd.fujixerox.edmics-rlc rlc
# image/vnd.globalgraphics.pgb
# image/vnd.microsoft.icon
# image/vnd.mix
# image/vnd.mozilla.apng
image/vnd.ms-modi mdi
image/vnd.ms-photo wdp
image/vnd.net-fpx npx
# image/vnd.radiance
```

```
# image/vnd.sealed.png
# image/vnd.sealedmedia.softseal.gif
# image/vnd.sealedmedia.softseal.jpg
# image/vnd.svf
# image/vnd.tencent.tap
# image/vnd.valve.source.texture
image/vnd.wap.wbmp  wbmp
image/vnd.xiff  xif
# image/vnd.zbrush.pcx
image/webp  webp
# image/wmf
image/x-3ds  3ds
image/x-cmu-raster  ras
image/x-cmx  cmx
image/x-freehand  fh fhc fh4 fh5 fh7
image/x-icon  ico
image/x-mrsid-image  sid
image/x-pcx  pcx
image/x-pict  pic pict
image/x-portable-anymap  pnm
image/x-portable-bitmap  pbm
image/x-portable-graymap  pgm
image/x-portable-pixmap  ppm
image/x-rgb  rgb
image/x-tga  tga
image/x-xbitmap  xbm
image/x-xpixmap  xpm
image/x-xwindowdump  xwd
# message/cpim
# message/delivery-status
# message/disposition-notification
# message/example
# message/external-body
# message/feedback-report
# message/global
# message/global-delivery-status
# message/global-disposition-notification
# message/global-headers
# message/http
# message/imdn+xml
# message/news
# message/partial
message/rfc822  eml mime
# message/s-http
# message/sip
# message/sipfrag
# message/tracking-status
# message/vnd.si.simp
```

message/vnd.wfa.wsc
model/example
model/gltf+json
model/iges igs iges
model/mesh msh mesh silo
model/vnd.collada+xml dae
model/vnd.dwf dwf
model/vnd.flatland.3dml
model/vnd.gdl gdl
model/vnd.gs-gdl
model/vnd.gs.gdl
model/vnd.gtw gtw
model/vnd.moml+xml
model/vnd.mts mts
model/vnd.opengex
model/vnd.parasolid.transmit.binary
model/vnd.parasolid.transmit.text
model/vnd.rosette.annotated-data-model
model/vnd.valve.source.compiled-map
model/vnd.vtu vtu
model/vrml wrl vrml
model/x3d+binary x3db x3dbz
model/x3d+fastinfoset
model/x3d+vrml x3dv x3dvz
model/x3d+xml x3d x3dz
model/x3d-vrml
multipart/alternative
multipart/appledouble
multipart/byteranges
multipart/digest
multipart/encrypted
multipart/example
multipart/form-data
multipart/header-set
multipart/mixed
multipart/parallel
multipart/related
multipart/report
multipart/signed
multipart/voice-message
multipart/x-mixed-replace
text/1d-interleaved-parityfec
text/cache-manifest appcache
text/calendar ics ifb
text/css css
text/csv csv
text/csv-schema
text/directory

text/dns
text/ecmascript
text/encaprtpt
text/enriched
text/example
text/fwdred
text/grammar-ref-list
text/html html htm
text/javascript
text/jcr-cnd
text/markdown
text/mizar
text/n3 n3
text/parameters
text/parityfec
text/plain txt text conf def list log in
text/provenance-notation
text/prs.fallenstein.rst
text/prs.lines.tag dsc
text/prs.prop.logic
text/raptorfec
text/red
text/rfc822-headers
text/richtext rtx
text/rtf
text/rtp-enc-aescm128
text/rtploopback
text/rtx
text/sgml sgml sgm
text/t140
text/tab-separated-values tsv
text/troff t tr roff man me ms
text/turtle ttl
text/ulpfec
text/uri-list uri uris urls
text/vcard vcard
text/vnd.a
text/vnd.abc
text/vnd.curl curl
text/vnd.curl.dcurl dcurl
text/vnd.curl.mcurl mcurl
text/vnd.curl.scurl scurl
text/vnd.debian.copyright
text/vnd.dmclientscript
text/vnd.dvb.subtitle sub
text/vnd.esmertec.theme-descriptor
text/vnd.fly fly
text/vnd.fmi.flexstor flx

text/vnd.graphviz gv
text/vnd.in3d.3dml 3dml
text/vnd.in3d.spot spot
text/vnd.iptc.newsml
text/vnd.iptc.nitf
text/vnd.latex-z
text/vnd.motorola.reflex
text/vnd.ms-mediapackage
text/vnd.net2phone.commcntr.command
text/vnd.radisys.msml-basic-layout
text/vnd.si.uricatalogue
text/vnd.sun.j2me.app-descriptor jad
text/vnd.trolltech.linguist
text/vnd.wap.si
text/vnd.wap.sl
text/vnd.wap.wml wml
text/vnd.wap.wmlscript wmls
text/x-asm s asm
text/x-c c cc cxx cpp h hh dic
text/x-fortran f for f77 f90
text/x-java-source java
text/x-nfo nfo
text/x-opml opml
text/x-pascal p pas
text/x-setext etx
text/x-sfv sfv
text/x-uuencode uu
text/x-vcalendar vcs
text/x-vcard vcf
text/xml
text/xml-external-parsed-entity
video/1d-interleaved-parityfec
video/3gpp 3gp
video/3gpp-tt
video/3gpp2 3g2
video/bmpeg
video/bt656
video/celb
video/dv
video/encaprtp
video/example
video/h261 h261
video/h263 h263
video/h263-1998
video/h263-2000
video/h264 h264
video/h264-rcdo
video/h264-svc

video/h265
video/iso.segment
video/jpeg jpgv
video/jpeg2000
video/jpm jpm jpgm
video/mj2 mj2 mjp2
video/mp1s
video/mp2p
video/mp2t
video/mp4 mp4 mp4v mpg4
video/mp4v-es
video/mpeg mpeg mpg mpe m1v m2v
video/mpeg4-generic
video/mpv
video/nv
video/ogg ogv
video/parityfec
video/pointer
video/quicktime qt mov
video/raptorfec
video/raw
video/rtp-enc-aescm128
video/rtploopback
video/rtx
video/smpte292m
video/ulpfec
video/vc1
video/vnd.cctv
video/vnd.dece.hd uvh uvvh
video/vnd.dece.mobile uvm uvvm
video/vnd.dece.mp4
video/vnd.dece.pd uvp uvvp
video/vnd.dece.sd uvs uvvs
video/vnd.dece.video uvv uvvv
video/vnd.directv.mpeg
video/vnd.directv.mpeg-tts
video/vnd.dlna.mpeg-tts
video/vnd.dvb.file dvb
video/vnd.fvt fvt
video/vnd.hns.video
video/vnd.iptvforum.1dparityfec-1010
video/vnd.iptvforum.1dparityfec-2005
video/vnd.iptvforum.2dparityfec-1010
video/vnd.iptvforum.2dparityfec-2005
video/vnd.iptvforum.ttsavc
video/vnd.iptvforum.ttsmpeg2
video/vnd.motorola.video
video/vnd.motorola.videop

video/vnd.mpegurl mxu m4u
video/vnd.ms-playready.media.pyv pyv
video/vnd.nokia.interleaved-multimedia
video/vnd.nokia.videovoip
video/vnd.objectvideo
video/vnd.radgamettools.bink
video/vnd.radgamettools.smacker
video/vnd.sealed.mpeg1
video/vnd.sealed.mpeg4
video/vnd.sealed.swf
video/vnd.sealedmedia.softseal.mov
video/vnd.uvu.mp4 uvu uvvu
video/vnd.vivo viv
video/vp8
video/webm webm
video/x-f4v f4v
video/x-fli fli
video/x-flv flv
video/x-m4v m4v
video/x-matroska mkv mk3d mks
video/x-mng mng
video/x-ms-asf asf asx
video/x-ms-vob vob
video/x-ms-wm wm
video/x-ms-wmv wmv
video/x-ms-wmx wmx
video/x-ms-wvx wvx
video/x-msvideo avi
video/x-sgi-movie movie
video/x-smv smv
x-conference/x-cooltalk ice

Found in path(s):

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/mime.types

No license file was found, but licenses were detected in source scan.

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- * limitations under the License.
- */

Found in path(s):

- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/server/reactive/ReactorServerHttpRequest.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/codec/support/BaseDefaultCodecs.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/server/reactive/DefaultServerHttpRequestBuilder.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/codec/support/BaseCodecConfigurer.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/converter/json/Jackson2ObjectMapperBuilder.java
- * /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/util/pattern/PathPatternParser.java
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No license file was found, but licenses were detected in source scan.

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/client/ClientHttpRequest.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/converter/feed/AtomFeedHttpMessageConverter.java
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```

1.311 @tensorflow/tfjs-backend-wasm 3.11.0

1.311.1 Available under license :

No license file was found, but licenses were detected in source scan.

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=====\n
*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppDType} from './types';\n\nlet
wasmGatherNd: (\n  xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n  sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend:

```

```
BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n    'number', // xId\n    'number', // dtype\n    'number', // indicesId\n    'number', // numSlices\n    'number', // sliceRank\n    'number', // sliceSize\n    'array', // strides\n    'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} = inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params, indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n    return out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n  const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmGatherNd(\n    xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n    stridesBytes, outId);\n\n  return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherNd\n};\n}"]}
```

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherNd.js.map
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```

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*\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {concatImplCPU} from
'./kernel_utils/shared';\n\nimport {identity} from './Identity';\n\nimport {reshape} from './Reshape';\n\nexport function
concat(\n  args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n  const {inputs, backend}
= args;\n\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n  let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n  // Keep only non-empty tensors (ignore tensors
with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n  if ($inputs.length ===
1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n\n  const out = backend.makeOutput(outShape,
inputs[0].dtype);\n\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n\n  const shapes =
$inputs.map(t => t.shape);\n  backend_util.assertParamsConsistent(shapes, axis);\n\n  if ($inputs[0].dtype ===
'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-
dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors into those less than
the\n    // axis to be concatenated and the rest. Then reshape the tensors\n    // into a two-dimensional tensor by
collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n
// the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize =
util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({inputs: {x: t},
backend, attrs: {shape}});\n    });\n\n    const inputsValShapes = inputs2D.map(t => {\n      return {vals:
backend.readSync(t.dataId), shape: t.shape};\n    });\n\n    // Concat 2d tensors along axis=1.\n    outShape =\nbackend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n    const simplyConcat =
inputs2D[0].shape[0] === 1;\n    const outVals = concatImplCPU(\n      inputsValShapes, outShape,\n      inputs[0].dtype,\n      simplyConcat) as string[];\n\n    const finalOutShape =\n
```



```
'number', // offset\n 'number', // outId\n ]);\n\nfunction select(args: {inputs: SelectInputs, backend:  
BackendWasm}) {\n  const {inputs, backend} = args;\n  const {condition, t, e} = inputs;\n  const conditionId =  
backend.dataIdMap.get(condition.dataId).id;\n  const tId = backend.dataIdMap.get(t.dataId).id;\n  const eId =  
backend.dataIdMap.get(e.dataId).id;\n  const out = backend.makeOutput(t.shape, t.dtype);\n  const outId =  
backend.dataIdMap.get(out.dataId).id;\n  const cRank = condition.shape.length;\n  const tRank =  
t.shape.length;\n  const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n  1 :\n  util.sizeFromShape(t.shape.slice(1));\n  wasmSelect(conditionId, tId, eId, offset, outId);\n  return out;\n}\n\nexport  
const selectConfig: KernelConfig = {\n  kernelName: Select,\n  backendName: 'wasm',\n  kernelFunc: select as {\n  as KernelFunc,\n  setupFunc: setup\n};\n}
```

Found in path(s):

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*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport {registerBackend, removeBackend, test_util, util} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line:no-imports-from-dist\nimport {ALL_ENVS, BROWSER_ENVS, describeWithFlags} from '@tensorflow/tfjs-core/dist/jasmine_util';\n\nimport {init, resetWasmPath} from './backend_wasm';\nimport {BackendWasm, setWasmPath, setWasmPaths} from './index';\n\n/**\n * Tests specific to the wasm backend. The name of these tests must start with\n * 'wasm' so that they are always included in the test runner. See\n * `env.specFilter` in `setup_test.ts` for details.\n */\n\n\ndescribeWithFlags('wasm read/write', ALL_ENVS, () => {\n  it('write and read values', async () => {\n    const x = tf.tensor1d([1, 2, 3]);\n    test_util.expectArraysClose([1, 2, 3], await x.data());\n  });\n\n  it('allocate repetitively and confirm reuse of heap space', () => {\n    const backend = tf.backend() as BackendWasm;\n    const size = 100;\n    // Allocate for the first time, record the memory offset and dispose.\n    const t1 = tf.zeros([size]);\n    const memOffset1 = backend.getMemoryOffset(t1.dataId);\n    t1.dispose();\n    // Allocate again and make sure the offset is the same (memory was reused).\n    const t2 = tf.zeros([size]);\n    const memOffset2 = backend.getMemoryOffset(t2.dataId);\n    // This should fail in case of a memory leak.\n    expect(memOffset1).toBe(memOffset2);\n  });\n\n  it('allocates buffers with byteOffsets', async () => {\n    const data = [-0.5, 0.5, 3.14];\n    const buffer = new ArrayBuffer(32);\n    const view = new Float32Array(buffer, 8, data.length);\n    // Write values to buffer.\n    for (let i = 0; i < data.length; ++i) {\n      view[i] = data[i];\n    }\n    const t = tf.tensor(view);\n    // Tensor values should match.\n    test_util.expectArraysClose(await t.data(), view);\n  });\n\n\n  describeWithFlags('wasm init', BROWSER_ENVS, () => {\n    beforeEach(() => {\n      registerBackend('wasm-test', async () => {\n        const {wasm} = await init();\n        return new BackendWasm(wasm);\n      }, 100);\n      // Silences backend registration warnings.\n      spyOn(console, 'warn');\n      spyOn(console, 'log');\n    });\n\n    afterEach(() => {\n      resetWasmPath();\n      removeBackend('wasm-test');\n    });\n\n    it('backend init fails when the path is invalid', async () => {\n      setWasmPath('invalid/path');\n      let wasmPath: string;\n      const realFetch = fetch;\n      spyOn(self, 'fetch').and.callFake((path: string) => {\n        wasmPath = path;\n        return realFetch(path);\n      });\n      expect(await tf.setBackend('wasm-test')).toBe(false);\n      expect(wasmPath).toBe('invalid/path');\n    });\n\n    it('backend init fails when setWasmPaths is called with '+\n      '\nan invalid prefix',\n      async () => {\n        setWasmPaths('invalid/prefix');\n        let wasmPath: string;\n        const realFetch = fetch;\n        spyOn(self, 'fetch').and.callFake((path: string) => {\n          wasmPath = path;\n          return realFetch(path);\n        });\n        expect(await tf.setBackend('wasm-test')).toBe(false);\n        expect(wasmPath).toContain('invalid/prefix');\n      });\n\n    it('backend init fails when setWasmPaths is called with '+\n      '\nan invalid fileMap',\n      async () => {\n        setWasmPaths({\n          'tfjs-backend-wasm.wasm':\n            'invalid/path',\n          'tfjs-backend-wasm-simd.wasm': 'invalid/path',\n          'tfjs-backend-wasm-threaded-simd.wasm': 'invalid/path'\n        });\n        let wasmPathPrefix: string;\n        const realFetch = fetch;\n        spyOn(self, 'fetch').and.callFake((path: string) => {\n          wasmPathPrefix = path;\n          return realFetch(path);\n        });\n        expect(await tf.setBackend('wasm-test')).toBe(false);\n        expect(wasmPathPrefix).toBe('invalid/path');\n      });\n  });\n}

```



```

it('setWasmPaths throws error when called without specifying a path for ' +\n      'each binary',\n      async () => {\n
  expect(() => {\n      setWasmPaths({\n        'tfjs-backend-wasm.wasm': '/base/wasm-out/tfjs-backend-wasm.wasm'\n      });\n    }).toThrow();\n  });\n  it('backend init works when the path is valid and use platform fetch',\n      async () => {\n      const usePlatformFetch = true;\n      const validPrefix = '/base/wasm-out';\n      setWasmPaths(validPrefix, usePlatformFetch);\n      let wasmPath: string;\n      const realFetch = util.fetch;\n      spyOn(util, 'fetch').and.callFake((path: string) => {\n        wasmPath = path;\n        return realFetch(path);\n      });\n      expect(await tf.setBackend('wasm-test')).toBe(true);\n      const validPaths = new Set([\n        validPrefix + 'tfjs-backend-wasm.wasm',\n        validPrefix + 'tfjs-backend-wasm-threaded-simd.wasm',\n      ]);\n      expect(validPaths).toContain(wasmPath);\n    });\n    it('backend init works when the wasm paths overrides map is valid and ' +\n      'using platform fetch',\n      async () => {\n      const usePlatformFetch = true;\n      const validPrefix = '/base/wasm-out';\n      setWasmPaths(\n        {\n          'tfjs-backend-wasm.wasm': '/base/wasm-out/tfjs-backend-wasm.wasm',\n          'tfjs-backend-wasm-simd.wasm':\n            '/base/wasm-out/tfjs-backend-wasm-simd.wasm',\n          'tfjs-backend-wasm-threaded-simd.wasm':\n            '/base/wasm-out/tfjs-backend-wasm-threaded-simd.wasm'\n        },\n        usePlatformFetch);\n      let wasmPath: string;\n      const realFetch = util.fetch;\n      spyOn(util, 'fetch').and.callFake((path: string) => {\n        wasmPath = path;\n        return realFetch(path);\n      });\n      expect(await tf.setBackend('wasm-test')).toBe(true);\n      const validPaths = new Set([\n        validPrefix + 'tfjs-backend-wasm.wasm',\n        validPrefix + 'tfjs-backend-wasm-simd.wasm',\n        validPrefix + 'tfjs-backend-wasm-threaded-simd.wasm',\n      ]);\n      expect(validPaths).toContain(wasmPath);\n    });\n    it('backend init works when the path is valid and use platform fetch',\n      async () => {\n      const usePlatformFetch = true;\n      const validPath = '/base/wasm-out/tfjs-backend-wasm.wasm';\n      setWasmPath(validPath, usePlatformFetch);\n      let wasmPath: string;\n      const realFetch = util.fetch;\n      spyOn(util, 'fetch').and.callFake((path: string) => {\n        wasmPath = path;\n        return realFetch(path);\n      });\n      expect(await tf.setBackend('wasm-test')).toBe(true);\n      expect(wasmPath).toBe(validPath);\n    });\n    // Disabling this test because it intermittently times out on CI.\n    // tslint:disable-next-line: ban\n    it('backend init fails when the path is invalid and use platform fetch',\n      async () => {\n      const usePlatformFetch = true;\n      setWasmPath('invalid/path', usePlatformFetch);\n      let wasmPath: string;\n      const realFetch = util.fetch;\n      spyOn(util, 'fetch').and.callFake((path: string) => {\n        wasmPath = path;\n        return realFetch(path);\n      });\n      expect(await tf.setBackend('wasm-test')).toBe(false);\n      expect(wasmPath).toBe('invalid/path');\n    });\n    it('backend init succeeds with default path',\n      async () => {\n      expect(await tf.setBackend('wasm-test')).toBe(true);\n    });\n    it('setWasmPath called too late',\n      async () => {\n      // Set an invalid path.\n      setWasmPath('invalid/path');\n      await tf.setBackend('wasm-test');\n      // Setting the path too late.\n      expect(() => setWasmPath('too/late')).toThrowError(/The WASM backend was already initialized. Make sure/);\n    });\n  });\n}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index_test.js.map
 No license file was found, but licenses were detected in source scan.

```

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```

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```
=====\n\n*\n\nimport { KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { Fill, FillAttrs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nexport function fill(args: { attrs: FillAttrs, backend: BackendWasm }) {\n  const { attrs: { shape, value, dtype }, backend } = args;\n  const out = backend.makeOutput(shape, dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(value as number);\n  return out;\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName: 'wasm',\n  kernelFunc: fill as { } as KernelFunc,\n};\n\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Fill.js.map

No license file was found, but licenses were detected in source scan.

```
/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * =====\n */
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/test_node.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/test_node.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/test_node.js

No license file was found, but licenses were detected in source scan.

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```

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kC;CAC/C,CAAC", "sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n *\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet
wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number,
varianceEpsilon: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number',
'number', 'number', 'number', 'number', 'number']);\n}\nfunction fusedBatchNorm(args: {\n backend:
BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =
inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =
backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n return out;\n}\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:
FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as
KernelFunc\n};\n"]}

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-  
wasm/dist/kernels/FusedBatchNorm.js.map
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No license file was found, but licenses were detected in source scan.

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```
=====\n\n*\n\n// Import shared functionality from tfjs-backend-cpu without triggering\n// side effects.\n// tslint:disable-next-line: no-imports-from-dist\nimport {concatImpl as concatImplCPU} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {sliceImpl as sliceImplCPU} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {rangeImpl as rangeImplCPU} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n\nexport {concatImplCPU, rangeImplCPU, sliceImplCPU};
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernel_utils/shared.js.map

No license file was found, but licenses were detected in source scan.

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```

throw new Error(\n      `FusedConv2D only supports rank-1 bias but got ` +\n      `rank
${biasData.shape.length}.`);\n  }\n  if (biasData.shape[0] !== outputChannels) {\n    throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not ` +\n      `match the number of output channels
(${outputChannels})`);\n  }\n  biasId = biasData.id;\n  }\n  const filterHeight = convInfo.filterHeight;\n  const
filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight =
convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const
strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize =
convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n  \n  if
(dataFormat !== 'NHWC') {\n    throw new Error(\n      `wasm backend FusedConv2D does not support
dataFormat:` +\n      `${dataFormat}`. Please use 'NHWC'.`);\n  }\n  \n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights == null ?\n    0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n  \n  wasmFusedConv2d(\n    xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n    biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n    fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n  \n  return out;\n  }\n  \n  export const fusedConv2DConfig:
KernelConfig = {\n    kernelName: FusedConv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:
fusedConv2d as {} as KernelFunc\n  };

```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/FusedConv2D.js.map

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No license file was found, but licenses were detected in source scan.

```

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Neg.js

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pack.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Equal.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SplitV.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reverse.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Range.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernel_utils/shared.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Fill.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cumsum.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Identity.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/OneHot.ts
No license file was found, but licenses were detected in source scan.
```

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BASIS,\n
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the
License for the specific language governing permissions and\n
 * limitations under the License.\n
 *
 * =====\n
 */" ] }
```

```

*\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTile: (\n  xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n  'number', // x_id\n  'array', // x_shape\n  'number', //
x_shape.length\n  'array', // new_shape\n  'number', // new_shape.length\n  'number' // out_id\n
]);\n\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n  const out =
backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n  CCppType[out.dtype], outId);\n  return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Tile.js.map

```

No license file was found, but licenses were detected in source scan.

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sContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const logicalAndConfig: KernelConfig =\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,
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```

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```
=====\n*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n"}\n
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Equal.js.map

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```

```
=====\n*\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n"}\n
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Ceil.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { identity } from './Identity';\nimport { reshape } from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array, outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n    'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number', // out_id\n  ]);\n\n  export function reverse(\n    args: { inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs }):\n    TensorInfo {\n    const { inputs, backend, attrs } = args;\n    const { x } = inputs;\n    const { dims } = attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return identity({ inputs: { x }, backend });\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n    const reshaped =\n      reshape({ inputs: { x: out }, attrs: { shape: x.shape }, backend });\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\n  export const reverseConfig: KernelConfig = {\n    kernelName: Reverse,\n    backendName: 'wasm',\n    kernelFunc: reverse as { } as KernelFunc,\n    setupFunc: setup\n  };"}\n\n
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reverse.js.map

No license file was found, but licenses were detected in source scan.

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```



```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Greater.js.map
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No license file was found, but licenses were detected in source scan.

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{"version":3,"file":"NonMaxSuppression_util.js","sourceRoot":"","sources":["../../src/kernels/NonMaxSuppression_util.ts"],"names":[],"mappings":"AAAA;;;;;;;GAeG;AAWH;;GAGG;AACH,MAAM,UAAU,iBAAiB,CAC7B,OAAoB,EAAE,SAAiB;IACzC,MAAM,MAAM,GAAG,IAAI,UAAU,CAAC,OAAO,CAAC,IAAI,CAAC,MAAM,CAAC,MAAM,EAAE,SAAS,EAAE,CAAC,CAAC,CAAC;IACxE,MAAM,gBAAgB,GAAG,MAAM,CAAC,CAAC,CAAC,CAAC;IACnC,MAAM,YAAZ,GAAG,MAAM,CAAC,CAAC,CAAC,CAAC;IAC/B,MAAM,eAAe,GAA G,MAAM,CAAC,CAAC,CAAC,CAAC;IACIC,MAAM,aAAa,GAAG,MAAM,CAAC,CAAC,CAAC,CAAC;IACChC,oEAAoE;IACpE,OAAO,CAAC,IAAI,CAAC,KAaK,CAAC,SAAS,CAAC,CAAC;IAC9B,OAAO,EAAC,gBAAgB,EAAE,YAAZ,EAAE,eAAe,EAAE,aAAa,EAAC,CAAC;AAC1E,CAAC","sourcesContent":["/**\n *\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * =====\n *\n * \n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in\n`non_max_suppression_impl.h`\n\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`\n * \n * \n\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset: number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppression_util.js.map
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No license file was found, but licenses were detected in source scan.

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```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Abs.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number, filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n  outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n  xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride: number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n    'number', // dyId\n    'number', // filterId\n    'number', // batchSize\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // inHeight\n    'number', // inWidth\n    'number', // inChannels\n    'number', // outHeight\n    'number', // outWidth\n    'number', // outChannels\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // topPad\n    'number', // leftPad\n    'number', // fltS0\n    'number', // fltS1\n    'number', // fltS2\n    'number', // xBatchStride\n    'number', // xRowStride\n    'number', // xColStride\n    'number', // xChannelStride\n    'number', // yBatchStride\n    'number', // yRowStride\n    'number', // yColStride\n    'number', // yChannelStride\n    'number', // outId\n  ]);\n\n  function conv2DBackpropInput(args: {\n    backend: BackendWasm,\n    inputs: Conv2DBackpropInputInputs,\n    attrs: Conv2DBackpropInputAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { dy, filter } = inputs;\n    const { strides, pad, dataFormat, dimRoundingMode, inputShape } = attrs;\n\n    const dilations = 1;\n    const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      inputShape, filter.shape as [number, number, number, number], strides,\n      dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n    const { batchSize, filterHeight, filterWidth, inChannels, inHeight,\n      inWidth, outChannels, outHeight, outWidth, strideHeight, strideWidth } =\n      convInfo;\n    const topPad = filterHeight - 1 - convInfo.padInfo.top;\n    const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n    const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n    const dxStrides = util.computeStrides(convInfo.inShape);\n    const dyStrides = util.computeStrides(dy.shape);\n    const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n    const xBatchStride = dxStrides[0];\n    const xRowStride = isChannelsLast ? dxStrides[1] : dxStrides[2];\n    const xColStride = isChannelsLast ? dxStrides[2] : 1;\n    const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n    const yBatchStride = dyStrides[0];\n    const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n    const yColStride = isChannelsLast ? dyStrides[2] : 1;\n    const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n    const out = backend.makeOutput(convInfo.inShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const dyId = backend.dataIdMap.get(dy.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n    wasmConv2DBackpropInput(\n      dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n      inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n      topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n      xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n      yChannelStride, outId);\n    return out;\n  }\n\n  export const conv2DBackpropInputConfig: KernelConfig = {\n    kernelName: Conv2DBackpropInput,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: conv2DBackpropInput as { } as KernelFunc\n  };}\n\n}
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=====\n
*\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {permuteAxesAndTranspose} from
 './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize:
number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n\n  function argmax(\n    args:
  {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n    const {backend, inputs, attrs} = args;\n
    const {axis} = attrs as {} as ArgMaxAttrs;\n    const {x} = inputs as {} as ArgMaxInputs;\n    const xId =
    backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes,
    inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n
      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n
        // transpose
        was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n
        inputId =
        transposedId;\n      }\n    }\n\n    const outShape = input.shape.slice(0, -1);\n    const out =
    backend.makeOutput(outShape, 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const outerSize =
    util.sizeFromShape(out.shape);\n    const innerSize = input.shape[axes[0]];\n    wasmFunc(inputId,

```

```
CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n // dispose of the\n transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const\n argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as {\n as KernelFunc,\n setupFunc: setup\n};\n"}\n}
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Ceil.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Round.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cosh.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Elu.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cosh.js
No license file was found, but licenses were detected in source scan.

```

```

{"version":3,"file": "_FusedMatMul.js", "sourceRoot": "", "sources": [ "../src/kernels/_FusedMatMul.ts"], "names": [], "
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```



```

backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n    ` _FusedMatMul only supports rank-1 bias but got ` +\n    `rank
${biasData.shape.length}.`);\n } \n biasId = biasData.id;\n } \n const preluActivationWeightsId =
preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const
fusedActivation =\n FusableActivation[activation as { } as keyof typeof FusableActivation];\n if
(fusedActivation == null) {\n throw new Error(\n    `${activation} activation not yet supported for
FusedConv2D ` +\n    `in the wasm backend.`);\n } \n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n
const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out =
backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new
Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n
wasmFusedMatMul(\n  aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n  transposeA,
transposeB, fusedActivation, biasId, preluActivationWeightsId,\n  leakyreluAlpha || 0, outId);\n\n return
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as { } as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/_FusedMatMul.js.map

```

No license file was found, but licenses were detected in source scan.

```

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Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\n// Register the wasm backend.\nimport './index';\n\n// tslint:disable-next-line: no-imports-from-dist\nimport
{setTestEnvs} from '@tensorflow/tfjs-core/dist/jasmine_util';\nimport jasmine from
'jasmine';\n\nError.stackTraceLimit = Infinity;\n\nprocess.on('unhandledRejection', e => {\n throw
e;\n});\n\nsetTestEnvs({name: 'wasm-node', backendName: 'wasm', isDataSync: true});\n\nconst runner = new
jasmine({});\n\nrunner.loadConfig({spec_files: ['src/**/*_test.ts'], random: false});\n\nif
(process.env.JASMINE_SEED) {\n runner.seed(process.env.JASMINE_SEED);\n}\n\nrunner.execute();\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/test_node.js.map

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No license file was found, but licenses were detected in source scan.

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AI,CAAC,KAAK,CAAC,GAAG,EAAE,IAAI,CAAC,QAAQ,EAAE;QAC/C,QAAQ;QACR,QAAQ;QACR,QAAQ
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number', // x_id\n
'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n    inputId = xId;\n    let input = x;\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We
will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n    }\n  }\n}
```

```
}
const inputRank = input.shape.length;
backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);
const [outShape, reduceShape] =
backend_util.computeOutAndReduceShapes(input.shape,
axes);
const reduceSize = util.sizeFromShape(reduceShape);
const out = backend.makeOutput(outShape,
input.dtype);
if (util.sizeFromShape(input.shape) !== 0) {
const outId =
backend.dataIdMap.get(out.dataId).id;
wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);
}
if (inputWasTransposed) {
// dispose of the transposed tensor.
backend.disposeData(transposed.dataId);
}
if (keepDims) {
// reshape
const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);
out.shape = newShape;
}
return out;
}
export const minConfig: KernelConfig = {
kernelName: Min,
backendName: 'wasm',
setupFunc: setup,
kernelFunc: min as {} as KernelFunc;
}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Min.js.map

No license file was found, but licenses were detected in source scan.

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"sourcesContent": ["**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *"]
}
```

```

import {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from
 '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
import {reshape} from
 './Reshape';
export function expandDims(args: {
inputs: ExpandDimsInputs,
attrs: ExpandDimsAttrs,
backend: BackendWasm}) {
const {inputs, attrs, backend} = args;
const {input} = inputs;
const {dim} =
attrs;
const inputRank = input.shape.length;
const newShape = input.shape.slice();
let $dim = dim;
if (dim < 0) {
// Negative value is counted from the tail of rank.
util.assert($dim - (inputRank + 1) <= dim,
() => `Axis must be in the interval [${-(inputRank + 1)}, ${inputRank}]`);
$dim = inputRank + dim
+ 1;
}
newShape.splice($dim, 0, 1);
return reshape({inputs: {x: input}, backend, attrs: {shape:
newShape}});
}
export const expandDimsConfig: KernelConfig = {
kernelName: ExpandDims,
backendName: 'wasm',
kernelFunc: expandDims as {} as KernelFunc;
}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ExpandDims.js.map

No license file was found, but licenses were detected in source scan.

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AC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\\n
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tanh.js.map

No license file was found, but licenses were detected in source scan.

```
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 *
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 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 *
=====
*/
/**
 * @deprecated Use `setWasmPaths` instead.
 * Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch to download
 * the wasm file, default to false.
```



```
*
* @doc {heading: 'Environment', namespace: 'wasm'}
*/
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/backend_wasm.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.js
No license file was found, but licenses were detected in source scan.
```

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the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function
createUnaryKernelConfig(kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n
'number', // out_id\n ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
// Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n
wasmFunc(xId, CCppType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/unary_kernel.js.map
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n *  
=====\  
\n *\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,  
TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast }  
from './Cast';\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest = 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes:  
number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number,  
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n    'number' // out id\n  ]);\n  \nfunction cropAndResize(args: {\n  backend: BackendWasm,\n  inputs: CropAndResizeInputs,\n
```

```
attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method,\n extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n const numBoxes =\n boxes.shape[0];\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =\n [numBoxes, cropHeight, cropWidth, image.shape[3]];\n let imagesData =\n backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData =\n cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n imagesData =\n backend.dataIdMap.get(castedData.dataId);\n }\n const imagesId = imagesData.id;\n const boxesId =\n backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n const\n out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const\n imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n const wasmCropAndResize(\n imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n InterpolationMethod[method as {}] as keyof typeof InterpolationMethod,\n extrapolationValue, outId);\n if\n (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n return out;\n }\n export const\n cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};
```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/CropAndResize.js.map
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No license file was found, but licenses were detected in source scan.

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```

```

'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n
'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n
]);\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs:
NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { iouThreshold,
maxOutputSize, scoreThreshold } = attrs;\n const { boxes, scores } = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n
// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor
=\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as { } as
KernelFunc,\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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```
=====\n*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {identity} from './Identity';\nimport {CppType} from './types';\nlet wasmTranspose: (\n  xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n  outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // dtype\n    'number', // outId\n    'array', // perm\n    'number', // perm.length\n  ]);\n}\n\nexport function transpose(\n  args: {\n    inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs\n  }): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n  // better due to simpler memory access pattern.\n  const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n  let permIsNoOp = true;\n  for (let i = 0; i < perm.length; i++) {\n    if (perm[i] !== i) {\n      permIsNoOp = false;\n    }\n  }\n  const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n  const x = {\n    dataId: inputs.x.dataId,\n    shape: reducedShape,\n    dtype: inputs.x.dtype\n  };\n  if (permIsNoOp) {\n    const cloned = identity({inputs, backend});\n    cloned.shape = outShape;\n    return cloned;\n  }\n  const out = backend.makeOutput(outShape, x.dtype);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  wasmTranspose(\n    xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n    perm.length);\n  return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n  return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]] {\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if (shape[i] !== 1) {\n      newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n      newPerm.push(perm[i]);\n    }\n  }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j = 0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i && (minValIdx === -1 || newPerm[minValIdx] >
```

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newPerm[j])) {\n    minValIdx = j;\n    }\n    newPerm[minValIdx] = i;\n    }\n    return [newShape,\n    newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n    kernelName: Transpose,\n    backendName:\n    'wasm',\n    kernelFunc: transpose as {} as KernelFunc,\n    setupFunc: setup,\n};\n}}}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transpose.js.map

No license file was found, but licenses were detected in source scan.

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```

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padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the
heap.\n\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor,
validOutputsTensor];\n\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
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as KernelFunc,\n};\n"}

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Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,

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```
=====\n*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:\n(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction\nsetup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null\n/*void*/, [\n  'number', // xId\n  'number', // blockSize\n  'number', // channelsLast\n  'array', // xStrides\n  'number', // xStridesLength\n  'array', // outputShape\n  'array', // outputStrides\n  'number', // outSize\n  'number', // outId\n  ]);\n\n  export function depthToSpace(args: {\n    backend: BackendWasm,\n    inputs: DepthToSpaceInputs,\n    attrs: DepthToSpaceAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {x} = inputs;\n    const {blockSize, dataFormat} = attrs;\n\n    const batchSize = x.shape[0];\n    const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n    const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n    const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n    const outputHeight = inputHeight * blockSize;\n    const outputWidth = inputWidth * blockSize;\n    const outputDepth = inputDepth / (blockSize * blockSize);\n\n    const outputShape = (dataFormat === 'NHWC') ?\n      [batchSize, outputHeight, outputWidth, outputDepth] :\n      [batchSize, outputDepth, outputHeight, outputWidth];\n\n    const out = backend.makeOutput(outputShape, 'float32');\n\n    const xData = backend.dataIdMap.get(x.dataId);\n    const xId = xData.id;\n    const xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n    const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n    const outStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n\n    wasmDepthToSpace(\n      xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n      outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n    return out;\n  }\n\n  export const depthToSpaceConfig: KernelConfig = {\n    kernelName: DepthToSpace,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: depthToSpace as {} as KernelFunc\n  };\n}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthToSpace.js.map

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```



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"/src/kernels/Greater.ts", "/src/kernels/GreaterEqual.ts", "/src/kernels/LeakyRelu.ts", "/src/kernels/Less.ts", "/src/kernels/LessEqual.ts", "/src/kernels/Log.ts", "/src/kernels/LogicalAnd.ts", "/src/kernels/Max.ts", "/src/kernels/Maximum.ts", "/src/kernels/MaxPool.ts", "/src/kernels/Mean.ts", "/src/kernels/Min.ts", "/src/kernels/Minimum.ts", "/src/kernels/MirrorPad.ts", "/src/kernels/Multiply.ts", "/src/kernels/Neg.ts", "/src/kernels/NonMaxSuppression_util.ts", "/src/kernels/NonMaxSuppressionV3.ts", "/src/kernels/NonMaxSuppressionV4.ts", "/src/kernels/NonMaxSuppressionV5.ts", "/src/kernels/NotEqual.ts", "/src/kernels/OneHot.ts", "/src/kernels/OnesLike.ts", "/src/kernels/Pack.ts", "/src/kernels/PadV2.ts", "/src/kernels/Pow.ts", "/src/kernels/Prelu.ts", "/src/kernels/Prod.ts", "/src/kernels/Range.ts", "/src/kernels/RealDiv.ts", "/src/kernels/Relu.ts", "/src/kernels/Relu6.ts", "/src/kernels/ResizeBilinear.ts", "/src/kernels/Reverse.ts", "/src/kernels/RotateWithOffset.ts", "/src/kernels/Round.ts", "/src/kernels/Rsqrt.ts", "/src/kernels/ScatterNd.ts", "/src/kernels/Select.ts", "/src/kernels/Sigmoid.ts", "/src/kernels/Sin.ts", "/src/kernels/Softmax.ts", "/src/kernels/SpaceToBatchND.ts", "/src/kernels/SplitV.ts", "/src/kernels/Sqrt.ts", "/src/kernels/Square.ts", "/src/kernels/SquaredDifference.ts", "/src/kernels/Step.ts", "/src/kernels/StridedSlice.ts", "/src/kernels/Sub.ts", "/src/kernels/Sum.ts", "/src/kernels/Tan.ts", "/src/kernels/Tanh.ts", "/src/kernels/Tile.ts", "/src/kernels/TopK.ts", "/src/kernels/Transform.ts", "/src/kernels/Unpack.ts", "/src/kernels/ZerosLike.ts", "/src/register_all_kernels.ts", "/src/flags_wasm.ts", "/wasm-out/tfjs-backend-wasm-threaded-simd.js", "/wasm-out/tfjs-backend-wasm-threaded-simd.worker.js", "/wasm-out/tfjs-backend-wasm.js", "/src/backend_wasm.ts", "/src/version.ts", "/src/base.ts"], "sourcesContent": ["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *// This enum must align with the enum defined in cc/backend.h.\n *export enum CppDType {\n *  float32 = 0,\n *  int32 = 1,\n *  bool = 2,\n *  string = 3,\n *  complex64 = 4\n *}\n *// Must match enum in cc/fusable_activations.h.\n *export\n *enum FusableActivation {\n *  linear = 0,\n *  relu = 1,\n *  relu6 = 2,\n *  prelu = 3,\n *  leakyrelu = 4,\n *  sigmoid = 5,\n *  elu = 6\n *}\n */**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n * License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required\n * by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n * License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *import { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from\n * '@tensorflow/tfjs-core';\n *import { BackendWasm } from '../backend_wasm';\n *import { FusableActivation } from\n * './types';\n *let wasmFusedMatMul: (\n *  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n *  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n *  transposeB: boolean, activation: number,\n *  biasId: number,\n *  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n * void;\n *function setup(backend: BackendWasm) {\n *  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,\n *  null /* void */, [\n *    'number', // a_id\n *    'array', // a_shape\n *    'number', // a_shape.length\n *    'number', // b_id\n *    'array', // b_shape\n *    'number', // b_shape.length\n *    'number', // transpose_a\n *    'number', // transpose_b\n *    'number', // activation\n *    'number', // biasId\n *    'number', // preluActivationWeightsId\n *    'number', //\n *    leakyreluAlpha\n *    'number' // out_id\n *  ]);\n *function fusedBatchMatMul(args: {\n *  inputs:\n *  _FusedMatMulInputs,\n *  backend: BackendWasm,\n *  attrs: _FusedMatMulAttrs\n *}) {\n *  const {inputs, backend,\n *  attrs} = args;\n *  const {a, b, bias, preluActivationWeights} = inputs;\n *  if (a.dtype !== 'float32' || b.dtype !==\n *  'float32') {\n *    throw new Error(\n *      `_FusedMatMul for non non-float32 tensors not yet supported.`);\n *  }\n *  const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n *  const aId =

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backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n    `_FusedMatMul only supports rank-1 bias but got ` +\n    `rank
${biasData.shape.length}.`);\n } \n biasId = biasData.id;\n } \n\n const preluActivationWeightsId =
preluActivationWeights == null ?\n 0 : \n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const
fusedActivation = \n FusableActivation[activation as { } as keyof typeof FusableActivation];\n if
(fusedActivation == null) {\n throw new Error(\n    `${activation} activation not yet supported for
FusedConv2D ` +\n    `in the wasm backend.`);\n } \n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n
const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out =
backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new
Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n
wasmFusedMatMul(\n  aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n  transposeA,
transposeB, fusedActivation, biasId, preluActivationWeightsId,\n  leakyreluAlpha || 0, outId);\n\n return
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as { } as KernelFunc\n};\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function
createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n
'number', // out_id\n ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
// Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n
wasmFunc(xId, CCppType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

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the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:\n  DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n    number,\n    bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n      void;\n\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /*\n    void */, [\n      'number', // a_id,\n      'array', // a_shape\n      'number', // a_shape.length\n      'number', // b_id\n      'array', // b_shape\n      'number', // b_shape.length\n      'number', // dtype\n      'number' // out_id\n    ]);\n  }\n\n  function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}): \n    TensorInfo {\n    const {backend,\n    inputs} = args;\n    const {a, b} = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId =\n    backend.dataIdMap.get(b.dataId).id;\n\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape =\n    backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape,\n    outputType);\n\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return\n    out;\n    }\n\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes =\n    new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const kernelFunc = () => wasmFunc(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n\n      CppDType[a.dtype], outId);\n\n    // Currently only some float operations support full broadcast.\n    if\n    (supportsFullBroadcast && a.dtype === 'float32') {\n      kernelFunc();\n      return out;\n    }\n\n    const\n    aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims =\n    backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n    v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA &&\n    loopsOverAllOfB) {\n      kernelFunc();\n      return out;\n    } else {\n      throw new Error(\n        `Broadcasting\n        along outer dims is not yet`\n        `supported for ${a.dtype} ${kernelName}`);\n    }\n  }\n\n  return\n  {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n\n"/**\n * @license\n * Copyright 2019 Google\n    LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n    use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n    http://www.apache.org/licenses/LICENSE-2.0\n * \n    Unless required by applicable law or agreed to in writing,\n    software\n    distributed under the License is distributed on an "AS IS" BASIS,\n    WITHOUT WARRANTIES\n    OR CONDITIONS OF ANY KIND, either express or implied.\n    See the License for the specific language\n    governing permissions and\n    limitations under the License.\n */\n
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*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from\n    './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All\n    Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n    use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n    http://www.apache.org/licenses/LICENSE-2.0\n * \n    Unless required by applicable law or agreed to in writing,\n    software\n    distributed under the License is distributed on an "AS IS" BASIS,\n    WITHOUT WARRANTIES\n    OR CONDITIONS OF ANY KIND, either express or implied.\n    See the License for the specific language\n    governing permissions and\n    limitations under the License.\n */\n
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*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport\n    {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmFunc:\n  (inputIds:\n  Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n    void;\n\nfunction setupFunc(backend:\n  BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n    'array', // input_ids\n    'number', // input_ids.length\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\n\nfunction addn(args: {inputs:
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TensorInfo[], backend: BackendWasm}) {\n  const {inputs, backend} = args;\n  const out =
backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if
(util.sizeFromShape(out.shape) === 0) {\n  return out;\n }\n\n const inputIds = inputs.map(x =>
backend.dataIdMap.get(x.dataId).id);\n  const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n
const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmFunc(inputIdsBytes, inputIds.length,
CppType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n  kernelName:
AddN,\n  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: addn as {} as KernelFunc,\n};\n"/**\n * @license\n
* Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n  TensorInfo {\n  const {inputs: {x}, backend} =
args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const inVals = backend.typedArrayFromHeap(x);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const
identityConfig: KernelConfig = {\n  kernelName: Identity,\n  backendName: 'wasm',\n  kernelFunc: identity as {} as
KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the 'License');\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from
'./Identity';\n\nimport {CppType} from './types';\n\nlet wasmTranspose: (\n  xId: number, xShape: Uint8Array,
xShapeLength: number, dtype: CppDType,\n  outId: number, perm: Uint8Array, permLength: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTranspose = backend.wasm.cwrap(Transpose, null /*
void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // dtype\n
'number', // outId\n    'array', // perm\n    'number', // perm.length\n  ]);\n}\n\nexport function transpose(\n  args:\n  {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n  TensorInfo {\n  const {inputs,
backend, attrs} = args;\n  // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better
due to simpler memory access pattern.\n  const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,
attrs.perm);\n\n  let permIsNoOp = true;\n  for (let i = 0; i < perm.length; i++) {\n    if (perm[i] !== i) {\n
permIsNoOp = false;\n    }\n  }\n  const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n  const x = {\n
dataId: inputs.x.dataId,\n  shape: reducedShape,\n  dtype: inputs.x.dtype\n};\n\n  if (permIsNoOp) {\n  const
cloned = identity({inputs, backend});\n  cloned.shape = outShape;\n  return cloned;\n }\n\n  const out =
backend.makeOutput(outShape, x.dtype);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n
const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n  wasmTranspose(xId,
xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n  perm.length);\n  return
out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new
Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n

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return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]
{\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if
(shape[i] !== 1) {\n      newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n
newPerm.push(perm[i]);\n    }\n  }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j =
0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i &&\n        (minValIdx === -1 || newPerm[minValIdx] >
newPerm[j])) {\n        minValIdx = j;\n      }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape,
newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName:
'wasm',\n  kernelFunc: transpose as {} as KernelFunc,\n  setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright
2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose
if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n *
@param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,
axis: number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank =
x.shape.length;\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const
permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let
inputWasTransposed = false;\n  if (permutedAxes !== null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];
}\n\n    axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({inputs: {x}, attrs: {perm:
permutedAxes}, backend});\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId =
backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n    }\n  }\n\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n"/**\n * @license\n *
Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null
/*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs:
AllAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =

```

```

util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return
out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any,
null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,
attrs: AnyAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n
const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n
const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis,
backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n
input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n
backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from 'tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from
'./kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize:
number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n
'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n ]);\n}\n\nfunction argmax(\n args:
{inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n
const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId =

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backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes,
inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n     // transpose
was not a no-op. We will need to dispose of this\n     // once we are done.\n     input = transposed;\n     inputId =
transposedId;\n   }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out =
backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize =
util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId,
CppType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n   // dispose of the
transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const
argMaxConfig: KernelConfig = {\n  kernelName: ArgMax,\n  backendName: 'wasm',\n  kernelFunc: argmax as { }
as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n
'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n
'number', // padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
strideHeight\n  'number', // strideWidth\n  'number', // channels\n  'number', // outId\n ]);\n}\n\nfunction
avgPool(\n  args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n  const {inputs, attrs,
backend} = args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n
`wasm backend does not support dataFormat: ` +\n    `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n
}\n\n  if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n    throw new Error(\n    `was backend
only supports average pooling with dilation = [1, 1],`\n    `got [`${convInfo.dilationHeight}`,\n
`${convInfo.dilationWidth}`].`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const
outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
outId);\n  return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: avgPool as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

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the specific language governing permissions and limitations under the License.

```
=====  
*  
\n\nimport { KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util } from '@tensorflow/tfjs-core';  
\n\nimport { BackendWasm } from './backend_wasm';  
\n\nexport function reshape(\n  args: { inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm }) {\n  const { inputs, attrs } = args;  
  const { x } = inputs;  
  const { shape } = attrs;  
  const xSize = util.sizeFromShape(x.shape);  
  const $shape = util.inferFromImplicitShape(shape, xSize);  
  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n      `shape must have the same number of elements.`);  
  // Backend needs to track refCount for the dataId for reshape op  
  args.backend.incref(x.dataId);  
  return { dataId: x.dataId, shape: $shape, dtype: x.dtype };  
}  
\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,  
  backendName: 'wasm',  
  kernelFunc: reshape as { } as KernelFunc  
};  
"/**  
 *  
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 * distributed under the License is distributed on an "AS IS" BASIS,  
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.  
 * See the License for the specific language governing permissions and  
 * limitations under the License.  
 */  
=====  
\n
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=====  
*  
\n\nimport { BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-core';  
\n\nimport { BackendWasm } from './backend_wasm';  
\n\nimport { reshape } from './Reshape';  
\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number, bShape: Uint8Array, bShapeSize: number, transposeA: boolean, transposeB: boolean, outId: number) => void;  
\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n    'number', // a_id  
    'array', // a_shape  
    'number', // a_shape.length  
    'array', // b_shape  
    'number', // b_shape.length  
    'number', // transpose_a  
    'number', // transpose_b  
    'number' // out_id  
  ]);  
\n\nfunction batchMatMul(args: {\n  inputs: BatchMatMulInputs,  
  backend: BackendWasm,  
  attrs: BatchMatMulAttrs  
) {\n  const { inputs, backend, attrs } = args;  
  const { a, b } = inputs;  
  const { transposeA, transposeB } = attrs;  
  if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n    throw new Error(`BatchMatMul for non float32 tensors not yet supported.`);  
  }  
  const aRank = a.shape.length;  
  const bRank = b.shape.length;  
  const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];  
  const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];  
  const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];  
  const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];  
  const outerDimsA = a.shape.slice(0, -2);  
  const outerDimsB = b.shape.slice(0, -2);  
  const batchDimA = util.sizeFromShape(outerDimsA);  
  const batchDimB = util.sizeFromShape(outerDimsB);  
  const batchDimsCompatible =\n    batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;  
  util.assert(\n    aRank >= 2 && bRank >= 2 && batchDimsCompatible,  
    () => `Error in matMul: the input batch dimensions must either be the ` +\n      `same or at least one input batch dimension must be 1. Got input ` +\n      `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);  
  const outShapeOuterDims =\n    batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);  
  const outShape =\n    outShapeOuterDims.concat([outerShapeA, outerShapeB]);  
  util.assert(\n    innerShapeA === innerShapeB,  
    () => `Error in matMul: inner shapes (${innerShapeA}) and ` +\n      `${innerShapeB} of Tensors with shapes ${a.shape} and ` +\n      `${b.shape} and transposeA=${transposeA} ` +\n      `and transposeB=${transposeB} must match.`);  
  const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :  
    [batchDimA, outerShapeA, innerShapeA];  
  const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :  
    [batchDimB, innerShapeB, outerShapeB];  
  // The rest of the implementation is designed to operate on rank-3 tensors  
  const a3d = reshape({ inputs: { x: a }, backend, attrs: { shape: a3dShape });  
  const b3d = reshape({ inputs: { x: b }, backend, attrs: { shape: b3dShape });  
  const a3dId = backend.dataIdMap.get(a3d.dataId).id;  
  const b3dId = backend.dataIdMap.get(b3d.dataId).id;  
  const leftDim
```


G9Mb2MoaSk7XG4gICAgY29uc3QgaW5Mb2MgPSBvdXRMb2MubWFwKChpZHg6IG51bWJlciwgaikgPT4ga
WR4ICsgYmVnaW5bal0pO1xuICAgIG91dEJ1Zi5zZXQoaW5CdWYUz2V0KC4uLmluTG9jKSwgLi4ub3V0TG9j
KTtcbiAgfVxuXG4gIGlMlChkdHlwZSA9PT0gJ3N0cmIuZycpIHtcbiAgICByZXR1cm4gYmFja2VuZGF91dGlsLm
Zyb21TdHJpbmdBcnJheVRvVWludDob3V0QnVmLnZhbHVlcyBhcyBzdHJpbmdbXSk7XG4gIH1cbiAgcmV0d
XJuIG91dEJ1Zi52YWx1ZXMgYXMGVHlwZWRBcnJheTtcbn1cblxuZXhwb3J0IGZ1bmN0aW9uIHNsaWNIKFxu
ICAgIGFyZ3M6IHtpbnB1dHM6IFNsaWNISW5wdXRzLCBiYWNRzW5kOiBNYXR0cmFja2VuZENQVSwgYX
R0cnM6IFNsaWNIQXR0cnN9KTtcbiAgICBUZw5zb3JjbmZvIHtcbiAgY29uc3Qge2lucHV0cywgYmFja2VuZC
wgYXR0cnN9ID0gYXJncztcbiAgY29uc3Qge3h9ID0gaW5wdXRzO1xuICBjb25zdCB7YmVnaW4sIHNpemV9ID
0gYXR0cnM7XG5cbiAgYXNzZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcbiAgICBjb25zdCBbJGJlZ2luLCAk
c2l6ZV0gPSBzbGljZV91dGlsLnBhcnNIU2xpY2VQYXJhbXMoeCwgYmVnaW4sIHNpemUpO1xuICBzbGljZV9
1dGlsLmFzc2VydFBhcmFtc1ZhbGlkKHgsICRiZWdpbiwgJHNpemUpO1xuXG4gIGNvbnN0IHZhbHMgPSBiYW
NRzW5kLmRhdGEuZ2V0KHguZGF0YUlkKS52YWx1ZXM7XG4gIGNvbnN0IG91dFZhbHMgPSBzbGljZUlcG
wodmFscywGJlZ2luLCAkc2l6ZSwgeC5zaGFwZSwgeC5kdHlwZSk7XG4gIHJldHVybiBiYWNRzW5kLm1ha2
VUZw5zb3JjbmZvKCRzaXplLCB4LmR0eXBILCBvdXRWYWxzKTtcbn1cblxuZXhwb3J0IGNvbnN0IHNsaWN
lQ29uZmlnOiBLZXJlZ2V0cmVDb25maWcgPSB7XG4gIGtcm5lbE5hbWU6IFNsaWNILFxuICBiYWNRzW5kTmFtZ
TogJ2NwdScsXG4gIGtcm5lbEZ1bmM6IHNsaWNlIGFzIHt9IGFzIEtcm5lbEZ1bmNcbn07XG4iXX0=","/*\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}  
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {sliceImplCPU} from  
 './kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:  
BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] =  
slice_util.parseSliceParams(x, begin, size);\n\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,  
size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const  
xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinuous)  
{\n  const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n  if (x.dtype === 'string') {\n  outData.stringBytes =\n    (xVals as Uint8Array[]).slice(flatOffset, flatOffset +  
util.sizeFromShape(size_));\n  } else {\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(\n    (xVals as TypedArray).subarray(flatOffset, flatOffset +  
util.sizeFromShape(size_));\n  );\n\n  return out;\n  }\n\n  if (x.dtype === 'string') {\n  const res =  
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n  outData.stringBytes = res as Uint8Array[];\n  return  
out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2)  
{\n  slice2d(\n    xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n    size_ as [number, number]);\n  } else if (rank === 3) {\n  slice3d(\n    xVals as TypedArray, xStrides[0], xStrides[1],  
outVals,\n    begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4)  
{\n  slice4d(\n    xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n    begin_ as [number,  
number, number, number],\n    size_ as [number, number, number, number]);\n  } else {\n  const res =\n  sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n  outVals.set(res);\n  }\n\n  return  
out;\n  }\n\n  function slice2d(\n    xVals: backend_util.TypedArray, xStride: number,\n    outVals:  
backend_util.TypedArray, begin: [number, number],\n    size: [number, number]): void {\n    let outOffset = 0;\n    const beginI = begin[0];\n    const beginJ = begin[1];\n    const endI = beginI + size[0];\n    for (let i = beginI; i < endI;  
i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]),  
outOffset);\n    outOffset += size[1];\n  }\n  }\n\n  function slice3d(\n    xVals: backend_util.TypedArray, xStride1:
```

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number, xStride2: number,\n  outVals: backend_util.TypedArray, begin: [number, number, number],\n  size:
[number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i <
endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n  xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n  xStride3:
number, outVals: backend_util.TypedArray,\n  begin: [number, number, number, number],\n  size: [number,
number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK
+ size[2];\n  const beginL = begin[3];\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++)
{\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *
=====
*/\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport
{reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction
batchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: BackendWasm,\n  attrs:
BatchToSpaceNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,
crops} = attrs;\n  const prod = blockShape.reduce((a, b) => a * b);\n  const reshaped =
backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n  const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n  const xTransposed =\n  transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n  const xTransposedReshaped = reshape(\n    {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n  const result = slice({\n    inputs: {x: xTransposedReshaped},\n    backend,\n
attrs: {begin: sliceBeginCoords, size: sliceSize}\n  });\n  backend.disposeData(xReshaped.dataId);\n
backend.disposeData(xTransposed.dataId);\n  backend.disposeData(xReshaped.dataId);\n  return
result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as { } as KernelFunc\n};\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n *
=====
*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function

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cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm});\n  TensorInfo {\n    const {inputs:
{x}, attrs: {dtype}, backend} = args;\n    const out = backend.makeOutput(x.shape, dtype);\n    const inVals =
backend.typedArrayFromHeap(x);\n    const outVals = backend.typedArrayFromHeap(out);\n    outVals.set(inVals);\n  }
return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmClip: (xId: number, min:
number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =
backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number', // x_id\n    'number', // min\n    'number', //
max\n    'number' // out_id\n  ]);\n}\n\nfunction clip(args: {\n  inputs: ClipByValueInputs,\n  backend:
BackendWasm,\n  attrs: ClipByValueAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n
const {clipValueMin, clipValueMax} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =
backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmClip(xId,
clipValueMin, clipValueMax, outId);\n  return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n
  kernelName: ClipByValue,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: clip as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*/\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {concatImplCPU} from
 './kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function
concat(\n  args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n    const {inputs, backend}
= args;\n\n    const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n    let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n    // Keep only non-empty tensors (ignore tensors
with 0 in their shape).\n    const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n    if ($inputs.length ===
1) {\n      return identity({inputs: {x: $inputs[0]}, backend});\n    }\n\n    const out = backend.makeOutput(outShape,
inputs[0].dtype);\n\n    if (util.sizeFromShape(outShape) === 0) {\n      return out;\n    }\n\n    const shapes =

```



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$inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype ===
'string') {\n // Any concat of n-dimensional tensors across any axis can be reduced to\n // a concatenation of two-
dimensional tensors across the axis 1 by first\n // partitioning the axes of the original tensors into those less than
the\n // axis to be concatenated and the rest. Then reshape the tensors\n // into a two-dimensional tensor by
collapsing these two sets of axes and\n // concatenate the resulting matrices across the axis 1, finally reshaping\n
// the result to have the proper shape.\n const inputs2D = $inputs.map(t => {\n const innerSize =
util.sizeFromShape(t.shape.slice(axis));\n const shape = [-1, innerSize];\n return reshape({inputs: {x: t},
backend, attrs: {shape}});\n });\n\n const inputsValShapes = inputs2D.map(t => {\n return {vals:
backend.readSync(t.dataId), shape: t.shape};\n });\n\n // Concat 2d tensors along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat =
inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n inputsValShapes, outShape,
inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const
outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n
return out;\n };\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims =
0;\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n
sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b <
batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const
innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return
out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n
kernelFunc: concat as {} as KernelFunc,\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmConv2d: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number,
filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad:
number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number,
inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n 'number', // xId\n
'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n
'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n
'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n
'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n
'number', // outputChannels\n 'number', // outId\n ]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend:
BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n
const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n
const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false,

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$dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const
padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom =
convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type
=== 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend
Conv2D does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
xRowStride: number, xColStride: number, xChannelStride: number,\n yBatchStride: number, yRowStride:
number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n ]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend:
BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const { backend, inputs, attrs } = args;\n const { dy, filter } = inputs;\n const { strides, pad, dataFormat,
dimRoundingMode, inputShape } = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n
inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =

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isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n    dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n    inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n    topPad, leftPad, fltS0, fltS1, fltS2,\n    xBatchStride, xRowStride,\n    xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n    yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n
kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
conv2DBackpropInput as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", "/**\n * @license\n
* Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,
TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { cast }
from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest
= 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes:
number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number,
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n  'number', // imagesId\n
'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n
'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n
'number' // out id\n ]);\n}\n\nfunction cropAndResize(args: {\n  backend: BackendWasm,\n  inputs: CropAndResizeInputs,\n
attrs: CropAndResizeAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {method,

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extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n\n const numBoxes =
boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =
[numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData =
backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n  castedData =
cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n  imagesData =
backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const
out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const
imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n
imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n  cropWidth,\n
InterpolationMethod[method as {}] as keyof typeof InterpolationMethod],\n  extrapolationValue, outId);\n\n if
(castedData != null) {\n  backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
cropAndResizeConfig: KernelConfig = {\n  kernelName: CropAndResize,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: cropAndResize as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from
 './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n  finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n    'number', // x_id\n    'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n    'number' //
dtype\n  ]);\n}\n\nexport function cumsum(\n  args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs}):\n  TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis,
exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n  util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n    () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n  // permute required axis
to inner most axis\n  const permutation = backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if (permutation !== null) {\n    permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n  const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n  const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n  const finalDim = permutedX.shape[permutedAxis];\n  const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n    permutedOutId, CppDType[x.dtype]);\n  // transpose data back if permuted\n  let out =
permutedOut;\n  if (permutation !== null) {\n    const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n    out = transpose(\n      {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n    backend.disposeData(permutedX.dataId);\n  }\n  backend.disposeData(permutedOut.dataId);\n  return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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```

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```
=====\n*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:\n\n(xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction\n\nsetup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null\n /*void*/, [\n    'number', // xId\n    'number', // blockSize\n    'number', // channelsLast\n    'array', // xStrides\n    'number', // xStridesLength\n    'array', // outputShape\n    'array', // outputStrides\n    'number', // outSize\n    'number', // outId\n  ]);\n\n  export function depthToSpace(args: {\n    backend: BackendWasm,\n    inputs: DepthToSpaceInputs,\n    attrs: DepthToSpaceAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {x} = inputs;\n    const {blockSize, dataFormat} = attrs;\n\n    const batchSize = x.shape[0];\n    const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n    const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n    const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n    const\n    outputHeight = inputHeight * blockSize;\n    const outputWidth = inputWidth * blockSize;\n    const outputDepth =\n    inputDepth / (blockSize * blockSize);\n\n    const outputShape = (dataFormat === 'NHWC') ?\n    [batchSize, outputHeight, outputWidth, outputDepth] :\n    [batchSize, outputDepth, outputHeight, outputWidth];\n\n    const\n    out = backend.makeOutput(outputShape, 'float32');\n\n    const xData = backend.dataIdMap.get(x.dataId);\n    const\n    xId = xData.id;\n    const xStridesBytes =\n    new Uint8Array(new\n    Int32Array(util.computeStrides(x.shape)).buffer);\n\n    const outputShapeBytes = new Uint8Array(new\n    Int32Array(outputShape).buffer);\n    const outStridesBytes =\n    new Uint8Array(new\n    Int32Array(util.computeStrides(outputShape)).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n\n    wasmDepthToSpace(\n    xId, blockSize, channelsLast,\n    xStridesBytes, x.shape.length - 1,\n    outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n    return\n    out;\n  }\n\n  export const depthToSpaceConfig: KernelConfig = {\n    kernelName: DepthToSpace,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: depthToSpace as {} as KernelFunc\n  }; \n\n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the\n   * \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the\n   * License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or\n   * agreed to in writing, software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for\n   * the specific language governing permissions and\n   * limitations under the License.\n   */\n}
```

```
=====\n*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,\n DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d:\n\n(xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop:\n number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight:\n number, dilationWidth: number, strideHeight: number, strideWidth: number, inputChannels: number,\n outputChannels: number,\n outId: number) => void;\n\nfunction\n\nsetup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n  backend.wasm.cwrap(DepthwiseConv2dNative, null /*void*/, [\n    'number', //\n    xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', //\n    filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', //\n    padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //\n    dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\n  function
```

```

depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs:
DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const
xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations == null ? [1, 1] : dilations;\n\n
const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape,
strides,\n    ($dilations as number | [number, number]), pad, dimRoundingMode,\n    true /* depthwise */);\n\n
const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop =
convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n        `wasm backend DepthwiseConv2dNative
does not support dataFormat: ` +\n        `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n    }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n    filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n    outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n", "/*\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n", "/*\n *

```

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```
=====\n*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from\n './Reshape';\n\nexport function expandDims(args: {\n  inputs: ExpandDimsInputs,\n  attrs: ExpandDimsAttrs,\n  backend: BackendWasm\n}) {\n  const {inputs, attrs, backend} = args;\n  const {input} = inputs;\n  const {dim} =\n  attrs;\n\n  const inputRank = input.shape.length;\n  const newShape = input.shape.slice();\n  let $dim = dim;\n  if\n  (dim < 0) {\n    // Negative value is counted from the tail of rank.\n    util.assert(\n      -(inputRank + 1) <= dim,\n      () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n        inputRank\n      }]);\n    $dim = inputRank + dim\n  + 1;\n  }\n  newShape.splice($dim, 0, 1);\n\n  return reshape({inputs: {x: input}, backend, attrs: {shape:\n  newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n  kernelName: ExpandDims,\n  backendName: 'wasm',\n  kernelFunc: expandDims as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright\n 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs:\n  FillAttrs, backend: BackendWasm}) {\n  const {attrs: {shape, value, dtype}, backend} = args;\n  const out =\n  backend.makeOutput(shape, dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(value as\n  number);\n  return out;\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName:\n  'wasm',\n  kernelFunc: fill as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All\n  Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-\n  core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch:\n  number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,\n  null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', //\n  imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n  args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n  const {image} = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId =\n  backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch,\n  imageHeight, imageWidth, numChannels] = image.shape;\n\n  wasmFlipLeftRight(\n    imageId, batch,\n    imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig:
```

```
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as { } as\n KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,\n TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet\n wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number,\n varianceEpsilon: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number',\n 'number', 'number', 'number', 'number', 'number']);\n}\nfunction fusedBatchNorm(args: {\n backend:\n BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const\n {backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =\n inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =\n backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const\n offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?\n backend.dataIdMap.get(scale.dataId).id : 0;\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-\ncircuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId,\n varianceEpsilon, outId);\n return out;\n}\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:\n FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as { } as\n KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
```


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```
=====\\n
*\\n\\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\\n\\nimport {BackendWasm} from '../backend_wasm';\\n\\nimport
{FusableActivation} from './types';\\n\\nlet wasmFusedConv2d:\\n  (xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\\n   filterId: number, filterHeight: number, filterWidth: number,\\n   biasId: number,
padTop: number, padRight: number, padBottom: number,\\n   padLeft: number, isSamePad: number,
dilationHeight: number,\\n   dilationWidth: number, strideHeight: number, strideWidth: number,\\n
inputChannels: number, outputChannels: number, activation: number,\\n   preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\\n    void;\\n\\nfunction setup(backend: BackendWasm) {\\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\\n  'number', // xId\\n  'number', //
batchSize\\n  'number', // inputHeight\\n  'number', // inputWidth\\n  'number', // filterId\\n  'number', //
filterHeight\\n  'number', // filterWidth\\n  'number', // biasId\\n  'number', // padTop\\n  'number', // padRight\\n
'number', // padBottom\\n  'number', // padLeft\\n  'number', // isSamePad\\n  'number', // dilationHeight\\n
'number', // dilationWidth\\n  'number', // strideHeight\\n  'number', // strideWidth\\n  'number', //
inputChannels\\n  'number', // outputChannels\\n  'number', // activation\\n  'number', //
preluActivationWeightsId\\n  'number', // leakyreluAlpha\\n  'number', // outId\\n ]);\\n}\\n\\nfunction
fusedConv2d(args: {\\n  inputs: FusedConv2DInputs,\\n  backend: BackendWasm,\\n  attrs: FusedConv2DAttrs\\n})
{\\n  const {inputs, attrs, backend} = args;\\n  const {x, filter, bias, preluActivationWeights} = inputs;\\n  const {\\n
  strides,\\n  pad,\\n  dilations,\\n  dataFormat,\\n  dimRoundingMode,\\n  activation,\\n  leakyreluAlpha\\n} =
attrs;\\n  const convInfo = backend_util.computeConv2DInfo((x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\\n  pad, dimRoundingMode);\\n  const fusedActivation = \\n
FusableActivation[activation as {} as keyof typeof FusableActivation];\\n  if (fusedActivation == null) {\\n
  throw
new Error(\\n    ` ${activation} activation not yet supported for FusedConv2D ` +\\n    ` in the wasm backend.`);\\n
}\\n  const xId = backend.dataIdMap.get(x.dataId).id;\\n  const filterId =
backend.dataIdMap.get(filter.dataId).id;\\n  const outputChannels = convInfo.outChannels;\\n  let biasId = 0;\\n
if (bias != null) {\\n  const biasData = backend.dataIdMap.get(bias.dataId);\\n  if (biasData.shape.length !== 1) {\\n
throw new Error(\\n    ` FusedConv2D only supports rank-1 bias but got ` +\\n    ` rank
${biasData.shape.length}. `);\\n  }\\n  if (biasData.shape[0] !== outputChannels) {\\n  throw new Error(\\n
` FusedConv2D bias shape (${biasData.shape}) does not ` +\\n    ` match the number of output channels
(${outputChannels}) `);\\n  }\\n  biasId = biasData.id;\\n }\\n  const filterHeight = convInfo.filterHeight;\\n const
filterWidth = convInfo.filterWidth;\\n const padTop = convInfo.padInfo.top;\\n const padRight =
convInfo.padInfo.right;\\n const padBottom = convInfo.padInfo.bottom;\\n const padLeft = convInfo.padInfo.left;\\n
const dilationHeight = convInfo.dilationHeight;\\n const dilationWidth = convInfo.dilationWidth;\\n const
strideHeight = convInfo.strideHeight;\\n const strideWidth = convInfo.strideWidth;\\n const inputChannels =
convInfo.inChannels;\\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\\n const batchSize =
convInfo.batchSize;\\n const inHeight = convInfo.inHeight;\\n const inWidth = convInfo.inWidth;\\n\\n if
(dataFormat !== 'NHWC') {\\n  throw new Error(\\n    ` wasm backend FusedConv2D does not support
dataFormat: ` +\\n    ` ${dataFormat}. Please use 'NHWC'. `);\\n  }\\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\\n  const outId = backend.dataIdMap.get(out.dataId).id;\\n const
preluActivationWeightsId = preluActivationWeights == null ? \\n  0 :\\n
backend.dataIdMap.get(preluActivationWeights.dataId).id;\\n  wasmFusedConv2d(\\n    xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\\n    biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\\n    fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\\n  return out;\\n}\\n}\\n\\nexport const fusedConv2DConfig:
KernelConfig = {\\n  kernelName: FusedConv2D,\\n  backendName: 'wasm',\\n  setupFunc: setup,\\n  kernelFunc:
```

fusedConv2d as {} as KernelFunc\n);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

=====
*\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\n  function
fusedDepthwiseConv2d(args: {\n    inputs: FusedDepthwiseConv2DInputs,\n    backend: BackendWasm,\n    attrs:
FusedDepthwiseConv2DAttrs\n  }) {\n    const {inputs, attrs, backend} = args;\n    const {x, filter, bias,
preluActivationWeights} = inputs;\n    const {\n      strides,\n      pad,\n      dilations,\n      dataFormat,\n      dimRoundingMode,\n      activation,\n      leakyreluAlpha\n    } = attrs;\n\n    const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
      pad, dimRoundingMode, true /* depthwise */);\n\n    const fusedActivation =\n      FusableActivation[activation as {}
as keyof typeof FusableActivation];\n    if (fusedActivation == null) {\n      throw new Error(\n        `${activation}
activation not yet supported for FusedDepthwiseConv2D`\n        +\n        `in the wasm backend.`);\n    }\n\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n    const
outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n    if (bias != null) {\n      const biasData =
backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n
          `FusedDepthwiseConv2D only supports rank-1 bias but got`\n          +\n          `rank ${biasData.shape.length}`);\n      }\n\n      if (biasData.shape[0] !== outputChannels) {\n        throw new Error(\n
          `FusedDepthwiseConv2D bias shape\n          (${biasData.shape}) does not`\n          +\n          `match the number of output channels (${outputChannels})`);\n      }\n\n      biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const
padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight =
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =
convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize =
convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if
(dataFormat !== 'NHWC') {\n      throw new Error(\n        `wasm backend FusedDepthwiseConv2D does not support
dataFormat:`\n        +\n        `${dataFormat}`. Please use 'NHWC'.`);\n    }\n\n    const out =
backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const

```

```

preluActivationWeightsId = preluActivationWeights == null ?\n    0 :\n
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n    xId, batchSize,\n    inHeight, inWidth, filterId, filterHeight, filterWidth,\n    biasId, padTop, padRight, padBottom, padLeft,\n    isSamePad, dilationHeight,\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n    fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const\n
fusedDepthwiseConv2DConfig: KernelConfig = {\n    kernelName: FusedDepthwiseConv2D,\n    backendName:\n
'wasm',\n    setupFunc: setup,\n    kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n\n", "/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n
the specific language governing permissions and\n * limitations under the License.\n *

```

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=====\n
*\n\nimport { gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo } from '@tensorflow/tfjs-\n
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from './types';\n\nlet\n
wasmGatherNd: (\n    xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n    sliceRank:\n
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n    void;\n\nfunction setup(backend:\n
BackendWasm): void {\n    wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n        'number', // xId\n
'number', // dtype\n        'number', // indicesId\n        'number', // numSlices\n        'number', // sliceRank\n
'number', //\n
sliceSize\n        'array', // strides\n        'number' // outId\n    ]);\n\n\nfunction gatherNd(args: { backend: BackendWasm,\n
inputs: GatherNdInputs }):\n    TensorInfo {\n        const { backend, inputs } = args;\n        const { params, indices } =\n
inputs;\n\n        const [resultShape, numSlices, sliceSize, strides] =\n            gather_util.prepareAndValidate(params,\n
indices);\n\n        const out = backend.makeOutput(resultShape, params.dtype);\n        if (numSlices === 0) {\n            return\n
out;\n        }\n\n        const indicesShape = indices.shape;\n        const sliceRank = indicesShape[indicesShape.length - 1];\n\n
const xData = backend.dataIdMap.get(params.dataId);\n        const xId = xData.id;\n        const indicesData =\n
backend.dataIdMap.get(indices.dataId);\n        const indicesId = indicesData.id;\n\n        const stridesBytes = new\n
Uint8Array(new Int32Array(strides).buffer);\n        const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmGatherNd(\n            xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n            stridesBytes,\n
outId);\n\n        return out;\n    }\n\n\nexport const gatherNdConfig: KernelConfig = {\n    kernelName: GatherNd,\n
backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: gatherNd\n};\n\n", "/**\n * @license\n
* Copyright 2019\n
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you\n
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES\n
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport { backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,\n
TensorInfo, TypedArray, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from\n
'../backend_wasm';\n\nimport { reshape } from './Reshape';\n\nimport { CppDType } from './types';\n\nlet wasmGather:\n
(\n    xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n    indicesId: number, batchSize:\n
number, outStrides: Uint8Array,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n        'number', // xId\n        'number', // dtype\n
'array', //\n
xStrides\n        'number', // stridesSize\n        'number', // indicesId\n        'number', // batchSize\n
'array', //\n
outStrides\n        'number' // outId\n    ]);\n\n\nfunction gatherV2(\n    args: { backend: BackendWasm, inputs:\n
GatherV2Inputs, attrs: GatherV2Attrs }):\n    TensorInfo {\n        const { backend, inputs, attrs } = args;\n        const { x,\n
indices } = inputs;\n        const { axis, batchDims } = attrs;\n\n        // Throw error when any index is out of bound.\n        const

```

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parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index
= indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n ]\n },\n backend\n });\n const
indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape =
[\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n ];\n\n
const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n\n const stridesSize = flattenX.shape.length - 1;\n\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n }\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n", "/**\n
* @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from '/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====

```

```

*\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from
'/types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n  'number', // x_id\n  'number', // dtype\n  'number', // leakyrelu_alpha\n  'number', //
out_id\n  ]);\n\n  export function leakyRelu(\n    args: \n      { inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm });\n  TensorInfo {\n    const { inputs: { x }, attrs: { alpha }, backend } = args;\n\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    // According to TF API, LeakyRelu returns float32 when input is either
float32\n    // or int32.\n    const out = backend.makeOutput(x.shape, 'float32');\n\n    if (util.sizeFromShape(x.shape)
!== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmFunc(xId, CppDType[x.dtype], alpha,
outId);\n    }\n\n    return out;\n  }\n\n  export const leakyReluConfig: KernelConfig = {\n    kernelName: LeakyRelu,\n    backendName: 'wasm',\n    setupFunc,\n    kernelFunc: leakyRelu as {} as KernelFunc,\n  };
\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport { KernelConfig, Less } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig = \n
createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport { KernelConfig, LessEqual } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig = \n
createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport { KernelConfig, Log } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'/unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n

```

```

*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\n\nexport const logicalAndConfig: KernelConfig =\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmMax: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n
'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function max(args: {backend:
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {reductionIndices: axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      input = transposed;\n      inputId =
transposedId;\n    }\n\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n    const reduceSize =
util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n    if
(util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n
      wasmMax(inputId, CCppType[x.dtype], reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the
transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    return out;\n  }\n\n  export const maxConfig: KernelConfig = {\n    kernelName: Max,\n    backendName: 'wasm',\n
setupFunc: setup,\n    kernelFunc: max as {} as KernelFunc\n  };\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n  'number', //
inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n  'number', //
padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
dilationHeight\n  'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number',
// inputChannels\n  'number', // outputChannels\n  'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} =
args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  // TF API
supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it
because it uses xnpack which only\n  // supports float32.\n  //\n  // Add the following assert only for the WASM
backend instead of at core op\n  // level.\n  //\n  // TODO: add support for int32 input.\n  util.assert(\n  x.dtype
=== 'float32',\n  () =>\n    `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n    `wasm
backend does not support dataFormat:` +\n    ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n  return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n  kernelName: MaxPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: maxPool
as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n  backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n  args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n  TensorInfo {\n  const {backend, inputs,
attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes,
inputWasTransposed} =\n  permuteAxesAndTranspose(x, axis, backend);\n\n  let reductionAxes = axes;\n  if

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(inputWasTransposed) {\n  const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n  if (transposedId
!== xId) {\n    // transpose was not a no-op. We will need to dispose of this\n    // once we are done.\n    input =
transposed;\n    inputId = transposedId;\n    reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n  }\n}\n\n backend_util.assertAxesAreInnerMostDims(\n  'mean',
reductionAxes, input.shape.length);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n  let castedInput = input;\n  if (input.dtype !== 'float32') {\n    castedInput =\n
cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n    inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n  }\n\n  const out = backend.makeOutput(outShape, 'float32');\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMean(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed
tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  if (input.dtype
!== 'float32') {\n    backend.disposeData(castedInput.dataId);\n  }\n\n  return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: mean as {}
as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number', // x_id\n
'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n}\n\nfunction min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n
let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We
will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n    }\n
}\n\n  const inputRank = input.shape.length;\n\n  backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape,
axes);\n  const reduceSize = util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape,
input.dtype);\n  if (util.sizeFromShape(input.shape) !== 0) {\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n    wasmMin(inputId, CCppType[x.dtype], reduceSize, outId);\n  }\n\n  if
(inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n
}\n\n  if (keepDims) {\n    // reshape\n    const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);\n    out.shape = newShape;\n  }\n\n  return out;\n}\n\nexport const minConfig: KernelConfig = {\n
kernelName: Min,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: min as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\ncreateBinaryKernelConfig(Minimum, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode {\n  reflect = 0,\n  symmetric = 1\n}\nlet wasmMirrorPad: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // mode\n    'number', // outId\n  ]);\n}\nfunction mirrorPad(args: {\n  inputs: MirrorPadInputs,\n  backend: BackendWasm,\n  attrs: MirrorPadAttrs\n}) {\n  const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n  const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n  const prePaddingsBytes = new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const postPaddingsBytes = new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n  wasmMirrorPad(xId, xShapeBytes, x.shape.length, CCppType[x.dtype], prePaddingsBytes,\n    postPaddingsBytes, MirrorPaddingMode[mode], outId);\n  return out;\n}\nexport const mirrorPadConfig: KernelConfig = {\n  kernelName: MirrorPad,\n  backendName: 'wasm',\n  kernelFunc: mirrorPad as {} as KernelFunc,\n  setupFunc: setup\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\ncreateBinaryKernelConfig(Multiply, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {BackendWasm} from './backend_wasm';\n\n// Analogous to `struct Result` in\n`non_max_suppression_impl.h`\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/*\n * Parse the result of the c++ method, which has the\n * shape equivalent to\n * `Result`\n */\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:\n  number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const\n  pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const\n  pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,\n  pValidOutputs};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n * the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,\n  NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number)\n=> number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n  NonMaxSuppressionV3,\n  'number', // Result*\n  [\n    'number', // boxesId\n    'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', // scoreThreshold\n  ]);\n}\n\nfunction kernelFunc(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV3Inputs,\n  attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold,\n  maxOutputSize, scoreThreshold} = attrs;\n  const {boxes, scores} = inputs;\n  const boxesId =\n  backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n  const\n  resOffset =\n  wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n  const\n  {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n  parseResultStruct(backend, resOffset);\n  // Since we are not using scores for V3, we have to delete it from the heap.\n  backend.wasm._free(pSelectedScores);\n  backend.wasm._free(pValidOutputs);\n  const selectedIndicesTensor\n  =\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n  return\n  selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n  kernelName:\n  NonMaxSuppressionV3,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc as {\n  KernelFunc\n  };;\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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License.\n * You may obtain a copy of the License at\n * <http://www.apache.org/licenses/LICENSE-2.0>\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n  padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n    NonMaxSuppressionV4,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', // scoreThreshold\n      'bool', // padToMaxOutputSize\n    ]);\n\n  function nonMaxSuppressionV4(args: {\n    backend: BackendWasm,\n    inputs: NonMaxSuppressionV4Inputs,\n    attrs: NonMaxSuppressionV4Attrs\n  }): TensorInfo[] {\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize } =\n      attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId =\n      backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n      padToMaxOutputSize);\n\n    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using scores for V4, we have to delete it from the heap.\n    backend.wasm._free(pSelectedScores);\n\n    const selectedIndicesTensor =\n      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n    const validOutputsTensor =\n      backend.makeOutput([], 'int32', pValidOutputs);\n\n    return [selectedIndicesTensor, validOutputsTensor];\n  }\n\n  export const nonMaxSuppressionV4Config: KernelConfig = {\n    kernelName: NonMaxSuppressionV4,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: nonMaxSuppressionV4 as {\n      as KernelFunc,\n    };,\n  };\n}\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n  (boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n  number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', // scoreThreshold\n      'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n    backend: BackendWasm,\n    inputs: NonMaxSuppressionV5Inputs,\n    attrs: NonMaxSuppressionV5Attrs\n  }): TensorInfo[] {\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma } =\n      attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n\n    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using\n
```

```

validOutputs for V5, we have to delete it from the
// heap.
backend.wasm._free(pValidOutputs);
const
selectedIndicesTensor =
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);
const
selectedScoresTensor =
backend.makeOutput([selectedSize], 'float32', pSelectedScores);
return
[selectedIndicesTensor, selectedScoresTensor];
}
}
export const nonMaxSuppressionV5Config: KernelConfig =
{
kernelName: NonMaxSuppressionV5,
backendName: 'wasm',
setupFunc: setup,
kernelFunc: kernelFunc
} as KernelFunc;
"/**
* @license
* Copyright 2020 Google LLC. All Rights Reserved.
* Licensed
under the Apache License, Version 2.0 (the "License");
* you may not use this file except in compliance with the
License.
* You may obtain a copy of the License at
* http://www.apache.org/licenses/LICENSE-2.0
* Unless required by applicable law or agreed to in writing, software
* distributed under the License is distributed
on an "AS IS" BASIS,
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.
* See the License for the specific language governing permissions and
* limitations under the
License.
*/

```

```

=====
import { KernelConfig, NotEqual } from '@tensorflow/tfjs-core';
import { createBinaryKernelConfig } from
'/binary_kernel';
const supportsFullBroadcast = false;
export const notEqualConfig: KernelConfig =
createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');
"/**
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*/

```

```

=====
import { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-
core';
import { BackendWasm } from './backend_wasm';
let wasmOneHot: (
indicesId: number, depth:
number, onValue: number, offValue: number,
outId: number) => void;
function setup(backend:
BackendWasm) {
wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [
'number', // indices_id
'number', // depth,
'number', // onValue
'number', // offValue
'number' // out_id
]);
}
function
oneHot(
args: { inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm }) {
const { inputs,
backend, attrs } = args;
const { indices } = inputs;
const { depth, onValue, offValue } = attrs;
const out =
backend.makeOutput([...indices.shape, depth], 'int32');
const outId = backend.dataIdMap.get(out.dataId).id;
const indicesData = backend.dataIdMap.get(indices.dataId);
const indicesId = indicesData.id;
wasmOneHot(indicesId, depth, onValue, offValue, outId);
return out;
}
export const oneHotConfig:
KernelConfig = {
kernelName: OneHot,
backendName: 'wasm',
setupFunc: setup,
kernelFunc: oneHot
} as KernelFunc;
"/**
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License.
*/

```

```

=====
import { KernelConfig, KernelFunc, OnesLike, OnesLikeInputs } from '@tensorflow/tfjs-core';
import { BackendWasm } from './backend_wasm';
function onesLike(args: { inputs: OnesLikeInputs, backend:
BackendWasm }) {
const { inputs: { x }, backend } = args;
const out = backend.makeOutput(x.shape, x.dtype);
const outVals = backend.typedArrayFromHeap(out);
outVals.fill(1);
return out;
}
export const
onesLikeConfig: KernelConfig = {
kernelName: OnesLike,
backendName: 'wasm',
kernelFunc: onesLike
} as KernelFunc;
"/**
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```

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```
=====  
*  
\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';  
\nimport {BackendWasm} from '../backend_wasm';  
\nimport {concat} from './Concat';  
\nimport {expandDims} from './ExpandDims';  
\nexport function pack(\n  args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):  
TensorInfo {\n  const {inputs, backend, attrs} = args;  
  const {axis} = attrs;  
\n  if (inputs.length === 1) {\n    return expandDims(\n      {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});  
  }  
\n  const shape = inputs[0].shape;  
  const dtype = inputs[0].dtype;  
\n  inputs.forEach(t => {\n    util.assertShapesMatch(\n      shape, t.shape, \n      'All tensors passed to stack must have matching shapes');  
    util.assert(\n      dtype === t.dtype, \n      () => 'All tensors passed to stack must have matching dtypes');  
  });  
\n  const intermediateTensorInfos: TensorInfo[] = [];  
  const expandedTensors = inputs.map(t => {\n    const expandedT =\n      expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});  
    intermediateTensorInfos.push(expandedT);  
    return expandedT;  
  });  
\n  const result = concat({inputs: expandedTensors, backend, attrs: {axis}});  
\n  intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));  
\n  return result;  
}  
\nexport const packConfig: KernelConfig = {\n  kernelName: Pack,  
  backendName: 'wasm',  
  kernelFunc: pack as {} as KernelFunc  
};  
"/**  
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 */
```

```
=====  
*  
\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';  
\nimport {BackendWasm} from '../backend_wasm';  
\nimport {fill} from './Fill';  
\nimport {CppType} from './types';  
\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,  
  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, \n  constantValue: number, outId: number) => void;  
\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number', // xId  
    'array', // x.shape  
    'number', // x.shape.length  
    'number', // x.dtype  
    'array', // pre-paddings  
    'array', // post-paddings  
    'number', // constantValue  
    'number', // outId  
  ]);  
\n  function pad(\n    args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n    const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;  
\n    const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] /* afterPad */);  
\n    if (util.sizeFromShape(x.shape) === 0) {\n      // Short-circuit the computation, since x doesn't have value, only  
      // the shape is used to compute output shape to pad.  
      return fill({\n        backend, \n        attrs: {shape: outShape, value: constantValue, dtype: x.dtype}  
      });  
    }  
\n    const xId = backend.dataIdMap.get(x.dataId).id;  
    const out = backend.makeOutput(outShape, x.dtype);  
    const outTensorData = backend.dataIdMap.get(out.dataId);  
    const outId = outTensorData.id;  
\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);  
\n    const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);  
    const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);  
    const prePaddingsBytes =\n      new Uint8Array(new Int32Array(prePaddingsFlat).buffer);  
    const postPaddingsBytes =\n      new Uint8Array(new Int32Array(postPaddingsFlat).buffer);  
\n    wasmPadV2(\n      xId, xShapeBytes, x.shape.length, \n      CCppType[x.dtype], prePaddingsBytes, \n      postPaddingsBytes, constantValue, outId);  
    return out;  
  }  
\n  export const padV2Config: KernelConfig = {\n    kernelName: PadV2, \n    backendName: 'wasm', \n    kernelFunc: pad as {} as KernelFunc  
  }  
}
```

KernelFunc,\n setupFunc: setup\n};\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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```
=====\n*\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\ncreateBinaryKernelConfig(Pow, supportsFullBroadcast);\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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```

```
=====\n*\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' // out_id\n  ]);\n  function prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n    const {inputs, backend} = args;\n    const {x, alpha} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if (input.dtype !== 'float32') {\n      castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n      inputId = backend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(x.shape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n\n    if (input.dtype !== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n\n    return out;\n  }\n  export const preluConfig: KernelConfig = {\n    kernelName: Prelu,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prelu as {} as KernelFunc\n  };\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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```

```
=====\n*\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\nlet wasmProd: (\n  xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n    'number',\n    'number'\n  ]);\n  function prod(args: {\n    backend: BackendWasm,\n    inputs: ProdInputs,\n    attrs: ProdAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n      const transposedId =
```

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backend.dataIdMap.get(transposed.dataId).id;\n  if (transposedId !== xId) {\n    // transpose was not a no-op. We
will need to dispose of this\n    // once we are done.\n    input = transposed;\n    inputId = transposedId;\n    reductionAxes = backend_util.getInnerMostAxes(\n      reductionAxes.length, input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n    'prod', reductionAxes, input.shape.length);\n  const [outShape,
reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize
= util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const prodConfig: KernelConfig = {\n  kernelName: Prod,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: prod as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google
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=====\n
*\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const
range =\n  (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n    const {backend, attrs} =
args;\n    const {start, stop, step, dtype} = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n
const out = backend.makeOutput([values.length], dtype);\n    const outVals =
backend.typedArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\nexport const rangeConfig:
KernelConfig = {\n  kernelName: Range,\n  backendName: 'wasm',\n  kernelFunc: range as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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```

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=====\n
*\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n  createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC.
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```

```

=====\n
*\n\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/*\n * @license\n
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```
=====  
* \nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core'; \nimport {createUnaryKernelConfig} from  
 './unary_kernel'; \nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6); \n", /* * \n *  
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=====
```

```
=====  
* \n \nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,  
 util} from '@tensorflow/tfjs-core'; \nimport {BackendWasm} from '../backend_wasm'; \nimport {cast} from  
 './Cast'; \nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number, \n  numChannels: number, newHeight: number, newWidth: number, \n  alignCorners: number, halfPixelCenters:  
 number, outId: number) => void; \nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear =  
 backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', //  
 oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', //  
 newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]); \n \nfunction  
 resizeBilinear(args: {\n  backend: BackendWasm, \n  inputs: ResizeBilinearInputs, \n  attrs: ResizeBilinearAttrs\n}):  
 TensorInfo {\n  const {backend, inputs, attrs} = args; \n  const {images} = inputs; \n  const {alignCorners,  
 halfPixelCenters, size} = attrs; \n  const [newHeight, newWidth] = size; \n  const [batch, oldHeight, oldWidth,  
 numChannels] = images.shape; \n  const outShape = [batch, newHeight, newWidth, numChannels]; \n  let xData =  
 backend.dataIdMap.get(images.dataId); \n  let castedData; \n  if (xData.dtype !== 'float32') {\n    castedData = \n  cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}}); \n    xData =  
 backend.dataIdMap.get(castedData.dataId); \n  } \n  const xId = xData.id; \n  const out =  
 backend.makeOutput(outShape, 'float32'); \n  if (util.sizeFromShape(images.shape) === 0) {\n    return out; \n  } \n  const outId = backend.dataIdMap.get(out.dataId).id; \n  wasmResizeBilinear(\n    xId, batch, oldHeight,  
 oldWidth, numChannels, newHeight, newWidth, \n    alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId); \n  if  
 (castedData !== null) {\n    backend.disposeData(castedData.dataId); \n  } \n  return out; \n} \n \nexport const  
 resizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear, \n  backendName: 'wasm', \n  setupFunc:  
 setup, \n  kernelFunc: resizeBilinear as {} as KernelFunc\n}; \n", /* * \n * @license \n * Copyright 2020 Google LLC.  
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 OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language  
 governing permissions and \n * limitations under the License. \n *  
=====
```

```
=====  
* \nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from  
 '@tensorflow/tfjs-core'; \nimport {BackendWasm} from '../backend_wasm'; \nimport {identity} from  
 './Identity'; \nimport {reshape} from './Reshape'; \nlet wasmReverse: (\n  xId: number, axes: Uint8Array,  
 axesLength: number, outShape: Uint8Array, \n  outShapeLength: number, outId: number) => void; \nfunction  
 setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n    'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number'  
 ]); \n}
```



```
// out_id\n ]);\n\n\nexport function reverse(\n  args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dims} = attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return identity({inputs: {x}, backend});\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n    const reshaped =\n      reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\n\nexport const reverseConfig: KernelConfig = {\n  kernelName: Reverse,\n  backendName: 'wasm',\n  kernelFunc: reverse as {} as KernelFunc,\n  setupFunc: setup\n};\n\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n  fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // radians\n    'number', // centerX\n    'number', // centerY\n    'array', // fillBytes\n    'number', // fillLength\n    'number', // outId\n  ]);\n\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,\n  backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n  const [centerX, centerY] =\n    backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n  const fillIsBlack = fillValue === 0;\n  const fullOpacityValue = 255;\n  const fillValues =\n    typeof fillValue === 'number' ?\n      [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n      [...fillValue, fullOpacityValue];\n  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n  wasmRotate(\n    imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n    centerY, fillBytes, fillValues.length, outId);\n  return out;\n}\n\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n  kernelName: RotateWithOffset,\n  backendName: 'wasm',\n  kernelFunc: rotateWithOffset as {} as KernelFunc,\n  setupFunc: setup\n};\n\n\n/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*\n\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n\n\n/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n"/**\n *\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppDType} from './types';\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', // sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs: ScatterNdInputs, attrs: ScatterNdAttrs\n    }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices, updates} = inputs;\n    const {shape} = attrs;\n    const out = backend.makeOutput(shape, updates.dtype);\n    if (util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n    const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n    const indicesData = backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n    const updatesData = backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n    const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n      sliceSize, stridesBytes, outputSize, outId);\n    return out;\n  }\n  export const scatterNdConfig: KernelConfig = {\n    kernelName: ScatterNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: scatterNd as {} as KernelFunc\n  };}\n"/**\n *\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number, offset: number,\n  outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n    'number', // offset\n    'number', // outId\n  ]);\n  function select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n    const {inputs, backend} = args;\n    const {condition, t, e} = inputs;\n    const conditionId =
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backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 : \n
util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as { }
as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport { KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
void */ , ['number', 'number']);\n}\n\nfunction sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\n
TensorInfo {\n const { backend, inputs: { x } } = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out
= backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId,
outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as { } as KernelFunc\n};\n", "/*\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'../unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", "/*\n * @license\n
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport { KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n
waswFunc = backend.wasm.cwrap(Softmax, null /* void */ , [\n 'number', // xId\n 'number', // outId\n
'number', // channels\n 'number' // batch\n ]);\n}\n\nfunction softmax(\n args: { backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs }):\n TensorInfo {\n const { backend, inputs: { logits }, attrs: { dim } } =
args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape,
logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n
const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if

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(util.sizeFromShape(out.shape) === 0) {\n  return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return\n out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: softmax as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *  
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\n\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,\n SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {padV2Config} from\n './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction\n spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:\n SpaceToBatchNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,\n paddings} = attrs;\n  const prod = util.sizeFromShape(blockShape);\n  const completePaddings: Array<number,\n number> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<number, number>));\n  for (let i = 1 +\n blockShape.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n  const paddedX =\n padV2Config.kernelFunc({\n    inputs: {x},\n    backend,\n    attrs: {paddings: completePaddings, constantValue:\n 0}\n  }) as TensorInfo;\n  const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape,\n blockShape, prod, false);\n  const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n  const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n  const reshapeInputs:\n ReshapeInputs = {x: paddedX};\n  const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n  const paddedXReshaped =\n reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n  const transposeInputs:\n TransposeInputs = {x: paddedXReshaped};\n  const transposeAttrs:\n TransposeAttrs = {perm:\n permutedReshapedPaddedPermutation};\n  const paddedXT =\n transpose({inputs: transposeInputs, backend,\n attrs: transposeAttrs});\n  const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n  const\n resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n  const result = reshape(\n {inputs:\n resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n  backend.disposeData(paddedX.dataId);\n  backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n  return\n result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n *  
Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *  
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\n\n*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-\n core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from\n './backend_wasm';\nimport {slice} from './Slice';\n\nexport function splitV(\n args: {inputs: SplitVInputs, attrs:\n SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n  const\n {numOrSizeSplits, axis} = attrs;\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n  const splitSizes =\n backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n  const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] =
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s;\n  const xSlice =\n    slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n  begin[$axis] += s;\n  return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName: 'wasm',\n  kernelFunc: splitV as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n    'number', // x_id\n    'number', // alpha\n    'number', // dtype\n    'number', // out_id\n  ]);\n\n  function step(\n    args: {\n      backend: BackendWasm,\n      inputs: StepInputs,\n      attrs: StepAttrs\n    }):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {alpha} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmStep(xId, alpha, CCppType[x.dtype], outId);\n    return out;\n  }\n\n  export const stepConfig: KernelConfig = {\n    kernelName: Step,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: step as {} as KernelFunc\n};\n\n"/**\n *

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```
=====\n*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from '../Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,\n  xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction\n  setup(backend: BackendWasm): void {\n    wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n      'number', // xId\n      'array', // xStrides\n      'number', // xRank\n      'array', // beginBytes\n      'array', // endBytes\n      'array', // stridesBytes\n      'array', // outShapeBytes\n      'array', // outStridesBytes\n      'number', //\n      outShapeLength\n      'number', // outId\n    ]);\n\n    export function stridedSlice(args: {\n      backend: BackendWasm,\n      inputs: StridedSliceInputs,\n      attrs: StridedSliceAttrs\n    }): TensorInfo {\n      const {backend, inputs, attrs} = args;\n      const {x} = inputs;\n\n      const {\n        begin,\n        end,\n        strides,\n        beginMask,\n        endMask,\n        ellipsisMask,\n        newAxisMask,\n        shrinkAxisMask\n      } = attrs;\n\n      const {\n        finalShapeSparse,\n        finalShape,\n        isIdentity,\n        sliceDim0,\n        isSimpleSlice,\n        begin: $begin,\n        end: $end,\n        strides: $strides\n      } =\n        slice_util.sliceInfo(\n          x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n            newAxisMask, shrinkAxisMask);\n\n      let result;\n\n      if (isIdentity) {\n        // Optimization #1, slice is a no-op plus reshape\n        result = reshape({inputs: {x},\n          backend, attrs: {shape: finalShape}});\n      } else if (sliceDim0 || isSimpleSlice) {\n        // Optimization #2, slice is\n        memory contiguous (only occurs in dim 0)\n        util.assert(\n          x.shape.length >= 1,\n          () => `Input must have\n          rank at least 1, got: ${x.shape.length}`);\n        const size = slice_util.computeOutShape($begin, $end, $strides);\n        // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n        const sliced = slice({inputs: {x},\n          backend, attrs: {begin: $begin, size}});\n        result =\n          reshape({inputs: {x: sliced}, backend, attrs: {shape:\n            finalShape}});\n        backend.disposeData(sliced.dataId);\n      } else {\n        const out =\n          backend.makeOutput(finalShapeSparse, 'float32');\n        const xId = backend.dataIdMap.get(x.dataId).id;\n        const\n          xStridesBytes =\n            new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n        const beginBytes\n          = new Uint8Array(new Int32Array($begin).buffer);\n        const endBytes = new Uint8Array(new\n          Int32Array($end).buffer);\n        const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n        const\n          outputShapeBytes =\n            new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n        const outStridesBytes =\n          new Uint8Array(\n            new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n        const outId =\n          backend.dataIdMap.get(out.dataId).id;\n\n        wasmStridedSlice(\n          xId, xStridesBytes, x.shape.length,\n          beginBytes, endBytes, stridesBytes,\n          outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n        result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n        backend.disposeData(out.dataId);\n      }\n\n      return result;\n    }\n\n    export const stridedSliceConfig: KernelConfig = {\n      kernelName: StridedSlice,\n      backendName: 'wasm',\n      setupFunc: setup,\n      kernelFunc: stridedSlice as {} as KernelFunc\n    };
  }\n}
```

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```
=====\n*\n\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n  './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n
```

createBinaryKernelConfig(Sub, supportsFullBroadcast);\n","/>\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*/\n\nimport { backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport\n { permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmSum: (xId:\n number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n    'number', // reduce_size\n    'number', // dtype\n    'number', // out_id\n  ]);\n\n  function sum(args: { backend:\n BackendWasm, inputs: SumInputs, attrs: SumAttrs }):\n TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let\n inputId = xId;\n    let input = x;\n\n    const { transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n      const\n transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was\n not a no-op. We will need to dispose of this\n // once we are done.\n        input = transposed;\n        inputId =\n transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n          reductionAxes.length,\n          input.shape.length);\n      }\n    }\n\n    backend_util.assertAxesAreInnerMostDims(\n      'sum', reductionAxes,\n      input.shape.length);\n    const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize =\n util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, input.dtype);\n    if\n (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of\n the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const\n newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    return out;\n  }\n\n  export const sumConfig: KernelConfig = {\n    kernelName: Sum,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: sum as {} as KernelFunc\n  };}\n","/>\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*/\n\nimport { KernelConfig, Tan } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n","/>\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*/\n\nimport { KernelConfig, Tanh } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
```

./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs } from '@tensorflow/tfjs-core';\nimport\n{ BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\nlet wasmTile: (\n  xId:\n  number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:\n  number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmTile =\n  backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', //\n    x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n  ]);\n}\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,\n  backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =\n  attrs;\n\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n    newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n  const out =\n  backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n  xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n  CppDType[out.dtype], outId);\n  return\n  out;\n}\n\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:\n  setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * License);\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs } from '@tensorflow/tfjs-\n * core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\nlet wasmTopK:\n  (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:\n  boolean, outValuesId: number,\n  outIndicesId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number',\n    // x.shape.length\n    'number', // x.dtype\n    'number', // k\n    'bool', // sorted\n    'number', // outValuesId\n    'number', // outIndicesId\n  ]);\n}\n\nexport const topk:\n  (\n  args: {inputs: TopKInputs, backend: BackendWasm,\n  attrs: TopKAttrs}) => \n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n    const {x} = inputs;\n    const {k, sorted} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const xShapeBytes\n  = new Uint8Array(new Int32Array(x.shape).buffer);\n    const outputShape = x.shape.slice();\n    outputShape[outputShape.length - 1] = k;\n    const outValues = backend.makeOutput(outputShape, x.dtype);\n    const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n    const outIndices =\n  backend.makeOutput(outputShape, 'int32');\n    const outIndicesId =\n  backend.dataIdMap.get(outIndices.dataId).id;\n\n    wasmTopK(\n      xId, xShapeBytes, x.shape.length,\n      CppDType[x.dtype], k, sorted,\n      outValuesId, outIndicesId);\n\n    return [outValues, outIndices];\n  };\n\nexport const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc:\n  setup,\n  kernelFunc: topk as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2021 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * License);\n * you may not use this
```


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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nlet wasmTransform: (\n  imageId:  
number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth:  
number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n  stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number)  
=> void;\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,  
null /*void*/, [\n    'number', // imageId\n    'number', // transformsId\n    'bool', // isBatchTransform\n    'number', // batch\n    'number', // outHeight\n    'number', // outWidth\n    'number', // numChannels\n    'number', // imageWidth\n    'number', // imageHeight\n    'array', // strides\n    'number', // stridesLength\n    'number', // interpolationModeId\n    'number', // fillModeId\n    'number', // fillValue\n    'number' // outId\n  ]);\n}\nfunction transform(\n  args: {\n    backend: BackendWasm, inputs: TransformInputs, attrs:  
TransformAttrs\n  }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { image, transforms } = inputs;\n  const { interpolation, fillMode, fillValue, outputShape } = attrs;\n  const [batch, imageHeight, imageWidth,  
numChannels] = image.shape;\n  const [outHeight, outWidth] =\n    outputShape != null ? outputShape :  
[imageHeight, imageWidth];\n  const outShape =\n    [batch, outHeight, outWidth,\n    numChannels] as  
[number, number, number, number];\n  const strides =\n    new Uint8Array(new  
Int32Array(util.computeStrides(image.shape)).buffer);\n  const out = backend.makeOutput(outShape,  
image.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const imageData =  
backend.dataIdMap.get(image.dataId);\n  const imageId = imageData.id;\n  const transformsData =  
backend.dataIdMap.get(transforms.dataId);\n  const transformsId = transformsData.id;\n  const  
interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n  let fillModeId;\n  switch (fillMode) {\n    case 'constant':\n      fillModeId = 1;\n      break;\n    case 'reflect':\n      fillModeId = 2;\n      break;\n    case 'wrap':\n      fillModeId = 3;\n      break;\n    case 'nearest':\n      fillModeId = 4;\n      break;\n    default:\n      fillModeId = 1;\n      break;\n  }\n  wasmTransform(\n    imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n    outWidth, numChannels, imageWidth, imageHeight, strides,\n    image.shape.length - 1, interpolationModeId,  
fillModeId, fillValue,\n    outId);\n  return out;\n}\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as { } as  
KernelFunc\n};\n\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the  
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License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n */
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { slice } from  
'./Slice';\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n  const { inputs, backend, attrs } = args;\n  const { value } = inputs;\n  let { axis } = attrs;\n  if (axis <  
0) {\n    axis += value.shape.length;\n  }\n  const numOutputs = value.shape[axis];\n  const rank =  
value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;  
i++) {\n    if (i !== axis) {\n      outShape[outIndex++] = value.shape[i];\n    }\n  }\n  const outs: TensorInfo[] = new
```

```

Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n   begin[axis] = i;\n   outs[i] = slice({inputs: {x: value}, attrs: {begin, size},\n   backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n\n\nexport const\nunpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as { } as\nKernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\nApache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\nLicense.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\non an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\nimplied.\n * See the License for the specific language governing permissions and\n * limitations under the\nLicense.\n *

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=====\n\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from './backend_wasm';\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:\nBackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\nconst outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\n\nexport const\nzerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike\nas { } as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\nunder the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\nLicense.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\non an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\nimplied.\n * See the License for the specific language governing permissions and\n * limitations under the\nLicense.\n *

```

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=====\n\n\n//\n\nWe explicitly import the modular kernels so they get registered in the\n// global registry when we compile the\nlibrary. A modular build would replace\n// the contents of this file and import only the kernels that are\nneeded.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {fusedMatMulConfig}\nfrom './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from\n './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport\n{anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig}\nfrom './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport\n{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport\n{ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport\n{concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport\n{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from\n './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from\n './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig}\nfrom './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from\n './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from\n './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from\n './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from\n './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from\n './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport\n{fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from\n './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport\n{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport\n{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport

```

```

{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
 './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
 './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
 './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
 './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
 './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
 './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
 './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
 './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n
  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n
  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n
  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n
  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n
  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n
  zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n\n"/**\n *
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```

2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at <http://www.apache.org/licenses/LICENSE-2.0>. Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====  
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array  
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that  
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new  
Uint8Array([\n  0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n  2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,  
11\n ]));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-  
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //  
TODO(annxingyuan): Enable node support once this is resolved:\n //  
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //  
Test for transferability of SABs (needed for Firefox)\n //  
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new  
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly  
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n  0, 97,  
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n  4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,  
11\n ]));\n } catch (e) {\n return false;\n }\n});\n\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :  
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return  
(\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =  
WasmBackendModuleThreadedSimd || {};\n\nfunction  
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}  
return HEAP8}function  
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}  
return HEAPU8}function  
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}  
return HEAP32}function  
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}  
return HEAPU32}function  
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}  
return HEAPF64}var Module=typeof  
WasmBackendModuleThreadedSimd!=="undefined"?WasmBackendModuleThreadedSimd: {};\nvar  
readyPromiseResolve,readyPromiseReject;Module["ready"]=new  
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var  
moduleOverrides={};var key;for(key in  
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var  
thisProgram= "./this.program";var quit_=function(status,toThrow){throw toThrow};var  
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var  
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof  
window==="object";ENVIRONMENT_IS_WORKER=typeof  
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof  
process.versions==="object"&&typeof  
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM  
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
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ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"];var scriptDirectory="";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"^")}arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir != "undefined" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("^")+1)}else{scriptDirectory=""}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=

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Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str="";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAtAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10|str.charCodeAtAt(++i)&1023);if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new

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Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmmM
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=nul
l}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what+="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-

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simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["T"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(--numWorkersToLoad)removeRunDependency("wasm-
instantiate")})))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("wasm-instantiate")}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err"failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err"wasm streaming compile failed: "+reason);err"falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)})}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err"Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(rejectPromise);return{}}var
ASM_CONSTS={10520:function(){throw"Canceled!"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===function"){callback(Module);continue}var func=callback.func;if(typeof
func===number){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg
)}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSY:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU

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SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOST
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
__emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw"Atomics.notify returned an unexpected value
"+ret}Module["_emscripten_futex_wake"]=__emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! killThread() can only ever be
called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
killThread!";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker(pthread=undefined)}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cancelThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cancelThread!";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({"cmd":"cancel"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cleanupThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cleanupThread!";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);__emscripten_register_main_browser_thread_id(tb);initWorker:function(){},threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=__pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd":"exit"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd":"cancelDone"})}},terminateAllThreads:function(){for(var t in
PThread.threads){var
pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThr

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ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){ var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){ var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){ var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!="_pthread_self"){ var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"]);}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\" to target pthread '+d["targetThread"]+\"', but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){__emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else
if(cmd===\"killThread\"){killThread(d[\"thread\"])}else
if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else
if(cmd===\"loaded\"){ worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{ worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\":
\"+d[\"text\"])}else if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else
if(cmd===\"alert\"){alert(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){ worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent
an error! \"+e.filename+\": \"+e.lineno+\":
\"+e.message)};if(ENVIRONMENT_IS_NODE){ worker.on(\"message\",function(data){ worker.onmessage({ data:d
ata})});worker.on(\"error\",function(data){ worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post
Message({\"cmd\":\"load\", \"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]|_scriptDir,\"wasmMemory\":wasmMe
memory,\"wasmModule\":wasmModule}},allocateUnusedWorker:function(){ var pthreadMainJs=locateFile(\"tfjs-
backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}}};function

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establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasnTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at:
\"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown
function\"])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!=\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\"cmd\": \"processQueuedMainThreadWork\"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\": \"processThreadQueu
e\"})}else {var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\": \"processThreadQueue\"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-
73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value
\"+ret}else {if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf

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++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emsripten_receive_on_main_thread_js(index,numCallArgs,args){_emsripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emsripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emsripten_receive_on_main_thread_js_callArgs)}function
_emsripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emsripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emsripten_resize_heap(requestedSize){var
oldSize=_emsripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emsripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListe
ners:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)

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{ var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return"";if(target==window)return"#window";
if(target==screen)return"#screen";return
target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){ var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){ var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){ var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){ var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){ canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){ var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){ var
canvas=findCanvasEventTarget(target);if(canvas){ return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var

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ext=ctx.getExtension("\ANGLE_instanced_arrays\");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ext["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcount){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var ext=ctx.getExtension("\OES_vertex_array_object");if(ext){ctx["createVertexArray"]=function(){return ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao){return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var ext=ctx.getExtension("\WEBGL_draw_buffers");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffersWEBGL"](n,bufs)};return 1}}function __webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("\WEBGL_multi_draw\"))}var GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],contexts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return ret},getSource:function(shader,count,string,length){var source="\";for(var i=0;i<count;++i){var len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return source},createContext:function(canvas,webGLContextAttributes){var ctx=canvas.getContext("\webgl",webGLContextAttributes);if(!ctx)return 0;var handle=GL.registerContext(ctx,webGLContextAttributes);return handle},registerContext:function(ctx,webGLContextAttributes){var handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof webGLContextAttributes.enableExtensionsByDefault===\undefined\||webGLContextAttributes.enableExtensionsByDefault){GL.initExtensions(context)}return handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(contextHandle){return GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contextHandle])GL.currentContext=null;if(typeof JSEvents===\object\))JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.contexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GLctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:function(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtensionsDone=true;var GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_object(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("\lose_context")<0&&ext.indexOf("\debug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var p=GL.programs[program];var ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var

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u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)!="\"){name=name.slice(0,name.lastIndexOf("\\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\\"+j+"\\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["default","low-power","high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha\":"!GROWABLE_HEAP_I32()[a+(0>>2)],"depth\":"!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil\":"!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias\":"!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha\":"!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer\":"!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat\":"!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
__fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function __fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
__fd_write(fd,iiov,iiovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iiov,iiovcnt,pnum);var num=0;for(var i=0;i<iiovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iiov+i*8>>2];var len=GROWABLE_HEAP_I32()[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function __pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
__pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasMTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t

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is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd\\":\\"run\\",\\"start_routine\\":threadParams.startRoutine,\\"arg\\":threadParams.arg,\\"threadInfoStruct\\":thre
adParams.pthread_ptr,\\"stackBase\\":threadParams.stackBase,\\"stackSize\\":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\\"undefined\\"){err(\\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\\");return
6}if(!pthread_ptr){err(\\"pthread_create called with a null thread pointer!\\");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;+i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd=\\\"spawnThread\\\";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw\\"Canceled!\\"}function
_emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\\"Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\\")}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err(\\"pthread_join attempted on a null thread
pointer!\\");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()===thread){err(\\"PThread
\\\"+thread+\\\" is attempting to join to itself!\\");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()===thread){err(\\"Main thread
\\\"+thread+\\\" is attempting to join to itself!\\");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\\"pthread_join attempted on thread
\\\"+thread+\\\", which does not point to a valid thread, or does not exist anymore!\\");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\\"Attempted to join thread
\\\"+thread+\\\", which was already detached!\\");return
ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus===1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({\\"cmd\\":\\"cleanupThread\\\",\\"thread\\":thread});return

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0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_logical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var __wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm_call_ctors\"])=Module[\"asm\"][\"B\"].apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"])=Module[\"asm\"][\"C\"].apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"])=Module[\"asm\"][\"D\"].apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"])=Module[\"asm\"][\"E\"].apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"])=Module[\"asm\"][\"F\"].apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"])=Module[\"asm\"][\"G\"].apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"])=Module[\"asm\"][\"H\"].apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"])=Module[\"asm\"][\"J\"].apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"])=Module[\"asm\"][\"K\"].apply(null,arguments)};var

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_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"][_"L"]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"][_"M"]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"][_"N"]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"][_"O"]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"][_"P"]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"][_"Q"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][_"R"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][_"S"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][_"T"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"][_"U"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][_"V"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][_"W"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"][_"X"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][_"Y"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][_"Z"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"][_"a"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][_"$"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][_"aa"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][_"ba"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][_"da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][_"ga"]).apply(null,arguments)};var

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_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][["ia"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][["la"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][["na"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][["oa"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][["pa"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][["qa"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][["ra"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["sa"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["ta"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["ua"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["za"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["Ea"]]).apply(null,arguments)};var

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_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["Ha"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["La"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Va"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Xa"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ya"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Za"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["a"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["$a"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,arguments)};var

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_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,argument
s)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,argu
ments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,argument
s)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,ar
guments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["f
b"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["g
b"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(nul
l,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments
)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"][["kb"]]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global
_libc=Module["_emscripten_get_global_libc"]=Module["asm"][["lb"]]).apply(null,arguments)};var
_pthread_self=Module["_pthread_self"]=function(){return(_pthread_self=Module["_pthread_self"]=Module["as
m"][["mb"]]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=M
odule["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_que
ued_calls"]=Module["asm"][["ob"]]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]
=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_proc
ess_queued_calls"]=Module["asm"][["pb"]]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread
_id"]=Module["asm"][["qb"]]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_ems
cripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"][["rb"]]).app
ly(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=Module["asm"][["sb"]]).apply(n
ull,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=Module["asm"]
[["tb"]]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=
Module["asm"][["ub"]]).apply(null,arguments)};var
__emscripten_call_on_thread=Module["__emscripten_call_on_thread"]=function(){return(__emscripten_call_on_t

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hread=Module["__emscripten_call_on_thread"]=Module["asm"][["vb"]].apply(null,arguments);var
__emscripten_tls_init=Module["__emscripten_tls_init"]=function(){return(__emscripten_tls_init=Module["__emscript
en_tls_init"]=Module["asm"][["wb"]].apply(null,arguments));var
__emscripten_thread_init=Module["__emscripten_thread_init"]=function(){return(__emscripten_thread_init=Mod
ule["__emscripten_thread_init"]=Module["asm"][["xb"]].apply(null,arguments));var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["yb"]].a
pply(null,arguments));var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][["zb"]].apply(null,arguments));var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ab"
]).apply(null,arguments));var
__emscripten_stack_set_limits=Module["__emscripten_stack_set_limits"]=function(){return(__emscripten_stack_set_
limits=Module["__emscripten_stack_set_limits"]=Module["asm"][["Bb"]].apply(null,arguments));var
__memalign=Module["__memalign"]=function(){return(__memalign=Module["__memalign"]=Module["asm"][["Cb
"]].apply(null,arguments));var
__emscripten_allow_main_runtime_queued_calls=Module["__emscripten_allow_main_runtime_queued_calls"]=1
0512;var
__emscripten_main_thread_futex=Module["__emscripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap
;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module
["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running..");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"](""),1});doRun(),1)}else{doRun()}}Module["run"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({"cmd":"exitProcess","returnCode":status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module["onExit"])Module["onExit"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n);}\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports["WasmBackendModuleThreadedSimd"] =
WasmBackendModuleThreadedSimd;\n","export const wasmWorkerContents = 'var Module={};function
threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(" ");console.error(text)}function
threadAlert(){var text=Array.prototype.slice.call(arguments).join("
");postMessage({"cmd":"alert",text:text,threadId:Module["_pthread_self"]()})}var
err=threadPrintErr;this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);r

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return instance.exports};function
moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wasmModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof
e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})else
if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else
if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\")(0,1);try{var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\"
PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else
if(ex!==\"unwind\")if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}}else{Module[\"PThread\"].threadExit(ex.status)}}el
se{Module[\"PThread\"].threadExit(-2);throw ex}}}}else
if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else
if(e.data.target===\"setimmediate\"){}else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEval
(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}};\"\\nvar
WasmBackendModule = (function() {\\n  var _scriptId = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\\n  if (typeof __filename !== 'undefined')
_scriptId = _scriptId || __filename;\\n  return (\\nfunction(WasmBackendModule) {\\n  WasmBackendModule =
WasmBackendModule || {};\\n\\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule: {};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\\n./this.program\\n;var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM

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ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=""function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=
nodePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"^")}arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer=="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data=="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit=="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console=="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print} }else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src;if(_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf("^")+1)}else{scriptDirectory=""}}{read_=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} }else{ }var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module["arguments"]){arguments_=Module["arguments"];}if(Module["thisProgram"]){thisProgram=
Module["thisProgram"];}if(Module["quit"]){quit_=Module["quit"];}var
wasmBinary;if(Module["wasmBinary"]){wasmBinary=Module["wasmBinary"];}var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!="object"){abort("no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!=null&&str!=undefined&&str!=0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType=="string")return UTF8ToString(ret);if(returnType=="boolean")return

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Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++
]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function

```

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addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
dependencies"](runDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==="function"){callback(Module);continue}var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function

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_emsripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emsripten_get_heap_size(){return HEAPU8.length}function
emsripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emsripten_resize_heap(requestedSize){var oldSize=_emsripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emsripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iiovcnt,pnum){var num=0;for(var
i=0;i<iiovcnt;i++){var ptr=HEAP32[iiov+i*8>>2];var len=HEAP32[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _thread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
asmLibraryArg={\"a\":_abort,\"d\":_emsripten_memcpy_big,\"e\":_emsripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_thread_create,\"g\":_thread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"

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asm\"][\p\"]).apply(null,arguments));var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm\"][\q\"]).apply(n
ull,arguments));var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm\"][\s\"]).apply(null,arguments
));var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm\"][\t\"]).apply(null,argument
s));var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm\"][\u\"]).apply(null,ar
guments));var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm\"][\v\"]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm\"][\w\"]).apply(null,argumen
ts));var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm\"][\x\"]).app
ly(null,arguments));var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm\"][\y\"]).a
pply(null,arguments));var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Modu
le["asm\"][\z\"]).apply(null,arguments));var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm\"][\A\"]).apply(null,argument
s));var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module[\
"asm\"][\B\"]).apply(null,arguments));var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm\"][\C\"]).ap
ply(null,arguments));var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Modul
e["_Conv2DBackpropInput"]=Module["asm\"][\D\"]).apply(null,arguments));var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm\"][\E\"]).apply(null,arguments
));var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm\"][\F\"]).apply(null,argu
ments));var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize\
"]=Module["asm\"][\G\"]).apply(null,arguments));var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm\"][\H\"]).a
pply(null,arguments));var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace\"]=M
odule["asm\"][\I\"]).apply(null,arguments));var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=M
odule["_DepthwiseConv2dNative"]=Module["asm\"][\J\"]).apply(null,arguments));var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm\"][\K\"]).apply(null,arguments)
};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm\"][\L\"]).apply(null,arg
uments));var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm\"][\M\"]).apply(null,argument
s));var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight\"]=Modu
le["asm\"][\N\"]).apply(null,arguments));var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm\"][\O\"]).apply(null,argu

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ments));var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]()["P"]);
apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]()["Q"]);apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]()["R"]);apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]()["S"]);apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]()["T"]);apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]()["U"]);apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]()["V"]);apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]()["W"]);apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]()["X"]);apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]()["Y"]);apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]()["Z"]);apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]()["_"]);apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"]()["$"]);apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]()["aa"]);apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]()["ba"]);apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]()["ca"]);apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]()["da"]);apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]()["ea"]);apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]()["fa"]);apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"]()["ga"]);apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"]()["ha"]);apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"]()["ia"]);apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"]()["ja"]);apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["asm"]()["ka"]);apply(null,arguments)};var

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ule["_NonMaxSuppressionV4"]=Module["asm"]["ka"].apply(null,arguments));var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Mod
ule["_NonMaxSuppressionV5"]=Module["asm"]["la"].apply(null,arguments));var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"]["ma"
]).apply(null,arguments));var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"]["na"].apl
y(null,arguments));var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"]["oa"].apply(nul
l,arguments));var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"]["pa"].apply(null,argume
nts));var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"]["qa"].apply(null,argu
ments));var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"]["ra"].apply(null,argum
ents));var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"]["sa"].app
ly(null,arguments));var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"]["ta"].apply(null,argume
nts));var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"]["ua"].apply(null,ar
guments));var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Mo
dule["asm"]["va"].apply(null,arguments));var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"]["wa"].app
ly(null,arguments));var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["asm"]["xa"].apply(null,arguments));var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"]["ya"].apply(nul
l,arguments));var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"]["za"].apply(null,arg
uments));var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"]["Aa
"].apply(null,arguments));var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"]["Ba"
]).apply(null,arguments));var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"]["Ca"].ap
ply(null,arguments));var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"]["Da"].apply(null,arguments)
);var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Ea"].ap
ply(null,arguments));var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Fa"].apply(null,argumen
ts));var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Ga"].apply(nu
ll,arguments));var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"]["Ha"].apply(null,arguments));var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Ia"].apply(null,argume

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nts));var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"]["Ja"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["Ka"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["La"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["Ma"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["Na"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["Oa"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["Pa"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["Qa"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["Ra"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"]["Sa"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["Ta"]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["Ua"]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"]["Va"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"]["Wa"]).apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"]["Xa"]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"]["Ya"]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"](""),1);doRun()},1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *

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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n\n*\nimport './flags_wasm';\nimport { backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn, engine, env, KernelBackend, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasmModule, WasmFactoryConfig } from './wasm-out/tfjs-backend-wasm';\nimport { BackendWasmThreadedSimdModule } from './wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\n// @ts-ignore\nimport { wasmWorkerContents } from './wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\ninterface TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount: number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap: DataStorage<TensorData>;\n\n  constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n    this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n    this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape: number[], dtype: DataType): DataId {\n    const dataId = { id: this.dataIdNextNumber++ };\n    this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start = util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return { kernelMs };\n  }\n\n  move(dataId: DataId, values: backend_util.BackendValues, shape: number[], dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n      this.dataIdMap.set(id, { id, stringBytes, shape, dtype, memoryOffset: null, refCount });\n    }\n    return;\n  }\n\n  const size = util.sizeFromShape(shape);\n  const numBytes = size * util.bytesPerElement(dtype);\n  const memoryOffset = this.wasm._malloc(numBytes);\n  this.dataIdMap.set(dataId, { id, memoryOffset, shape, dtype, refCount });\n  this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n  if (values != null) {\n    this.wasm.HEAPU8.set(new Uint8Array(values as backend_util.TypedArray).buffer, (values as backend_util.TypedArray).byteOffset, numBytes, memoryOffset);\n  }\n\n  read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const { memoryOffset, dtype, shape, stringBytes } = this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(memoryOffset, memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data = this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n      this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData` */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData = this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision(): 32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n
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this.wasm.PThread.terminateAllThreads();\n  }\n  this.wasm = null;\n }\n\n memory() {\n  return {unreliable:
false};\n }\n\n /**\n  * Make a tensor info for the output of an op. If `memoryOffset` is not\n  * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n  * is present, the memory was allocated
elsewhere (in c++) and we just record\n  * the pointer where that memory lives.\n  *\n  makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):\n  TensorInfo {\n  let dataId: {};\n  if (memoryOffset
== null) {\n    dataId = this.write(null /* values */, shape, dtype);\n  } else {\n    const id =
this.dataIdNextNumber++;\n    dataId = {id};\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});\n    const size = util.sizeFromShape(shape);\n    this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n  }\n  return {dataId, shape, dtype};\n }\n\n typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n  backend_util.TypedArray {\n  const buffer = this.wasm.HEAPU8.buffer;\n  const
{memoryOffset} = this.dataIdMap.get(dataId);\n  const size = util.sizeFromShape(shape);\n  switch (dtype) {\n
case 'float32':\n    return new Float32Array(buffer, memoryOffset, size);\n  case 'int32':\n    return new
Int32Array(buffer, memoryOffset, size);\n  case 'bool':\n    return new Uint8Array(buffer, memoryOffset,
size);\n  default:\n    throw new Error(`Unknown dtype ${dtype}`);\n  }\n }\n\n\nfunction
createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n
// miniprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n  if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n  }\n  response.arrayBuffer().then(binary => {\n
  WebAssembly.instantiate(binary, imports).then(output => {\n    callback(output.instance, output.module);\n
  });\n  });\n  });\n  return {};\n });\n\n\n/**\n  * Returns the path of the WASM binary.\n  * @param
simdSupported whether SIMD is supported\n  * @param threadsSupported whether multithreading is supported\n  *
@param wasmModuleFolder the directory containing the WASM binaries.\n  */\nfunction getPathToWasmBinary(\n
  simdSupported: boolean, threadsSupported: boolean,\n  wasmModuleFolder: string) {\n  if (wasmPath != null) {\n
// If wasmPath is defined, the user has supplied a full path to\n  // the vanilla .wasm binary.\n  return
wasmPath;\n  }\n\n  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported &&
threadsSupported) {\n    path = 'tfjs-backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path =
'tfjs-backend-wasm-simd.wasm';\n  }\n\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n    }\n  }\n\n  return wasmModuleFolder + path;\n }\n\n\n/**\n  * Initializes the wasm
module and creates the js <--> wasm bridge.\n  *\n  * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n  * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n  * in
Chrome 76).\n  */\nexport async function init(): Promise<{wasm: BackendWasmModule}> {\n  const
[simdSupported, threadsSupported] = await Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n\n  return new Promise((resolve, reject) =>
{\n    const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function overrides the Emscripten
module locateFile utility.\n     * @param path The relative path to the file that needs to be loaded.\n     * @param
prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n      const response = wasmWorkerContents;\n      const blob = new
Blob([response], {type: 'application/javascript'});\n      return URL.createObjectURL(blob);\n    }\n\n    if
(path.endsWith('.wasm')) {\n      return getPathToWasmBinary(\n        simdSupported as boolean,\n
threadsSupported as boolean,\n        wasmPathPrefix != null ? wasmPathPrefix : prefix);\n    }\n\n    return prefix
+ path;\n  });\n\n  // Use the instantiateWasm override when system fetch is not available.\n  // Reference:\n  //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n    factoryConfig.instantiateWasm =\n
createInstantiateWasmFunc(getPathToWasmBinary(\n      simdSupported as boolean, threadsSupported as
boolean,\n      wasmPathPrefix != null ? wasmPathPrefix : ''));\n  }\n\n  let initialized = false;\n
factoryConfig.onAbort = () => {\n    if (initialized) {\n      // Emscripten already called console.warn so no need to
double log.\n      return;\n    }\n    if (initAborted) {\n      // Emscripten calls `onAbort` twice, resulting in double

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error\n    // messages.\n    return;\n    }\n    initAborted = true;\n    const rejectMsg =\n        'Make sure the
server can serve the `.wasm` file relative to the '+\n        'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers;\n
reject({message: rejectMsg});\n    };\n\n    let wasm: Promise<BackendWasmModule>;\n    // If `wasmPath` has
been defined we must initialize the vanilla module.\n    if (threadsSupported && simdSupported && wasmPath ===
null) {\n        factoryConfig.mainScriptUrlOrBlob = new Blob(\n            [var WasmBackendModuleThreadedSimd = `
+\n            wasmFactoryThreadedSimd.toString()),\n            {type: 'text/javascript'});\n        wasm =
wasmFactoryThreadedSimd(factoryConfig);\n    } else {\n        // The wasmFactory works for both vanilla and SIMD
binaries.\n        wasm = wasmFactory(factoryConfig);\n    }\n\n    // The WASM module has been successfully
created by the factory.\n    // Any error will be caught by the onAbort callback defined above.\n\n    wasm.then((module) => {\n        initialized = true;\n        initAborted = false;\n\n        const voidReturnType: string =
null;\n        // Using the tfjs namespace to avoid conflict with emscripten's API.\n        module.tfjs = {\n            init:
module.cwrap('init', null, []),\n            initWithThreadsCount:\n                module.cwrap('init_with_threads_count', null,
[number']),\n            getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n            registerTensor:
module.cwrap(\n                'register_tensor', null,\n                [\n                    'number', // id\n                    'number', // size\n                    'number', // memoryOffset\n                ]),\n            disposeData: module.cwrap('dispose_data', voidReturnType,
[number']),\n            dispose: module.cwrap('dispose', voidReturnType, []),\n        };\n\n        resolve({wasm: module});\n    });\n    });\n\nfunction typedArrayFromBuffer(\n    buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n    switch (dtype) {\n        case 'float32':\n            return new Float32Array(buffer);\n        case
'int32':\n            return new Int32Array(buffer);\n        case 'bool':\n            return new Uint8Array(buffer);\n        default:\n            throw new Error(`Unknown dtype ${dtype}`);\n    }\n}\n\nconst wasmBinaryNames = [
' tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n    'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\n\nconst WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * \n * @doc {heading: 'Environment', namespace: 'wasm'}\n *
\n * ^\n * export function setWasmPath(path: string, usePlatformFetch = false): void {\n    deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n        ' ' will be removed in a future release.);\n    if
(initAborted) {\n        throw new Error(\n            'The WASM backend was already initialized. Make sure you call '+\n            `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n    }\n    wasmPath = path;\n    customFetch =
usePlatformFetch;\n    }\n\n/**\n * Configures the locations of the WASM binaries.\n * \n * \n * \n * setWasmPaths({\n *
' tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
\n * \n * \n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n *
SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n *
full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n * \n * @doc {heading:
'Environment', namespace: 'wasm'}\n * ^\n * export function setWasmPaths(\n    prefixOrFileMap: string|{\n        [key in
WasmBinaryName]?: string\n    },\n    usePlatformFetch = false): void {\n    if (initAborted) {\n        throw new Error(\n
'The WASM backend was already initialized. Make sure you call '+\n            `setWasmPaths()` before you call
`tf.setBackend()` or '+\n            `tf.ready()`);\n    }\n\n    if (typeof prefixOrFileMap === 'string') {\n        wasmPathPrefix
= prefixOrFileMap;\n    } else {\n        wasmFileMap = prefixOrFileMap;\n        const missingPaths =\n            wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n        if (missingPaths.length > 0) {\n            throw new

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Error(\n      `There were no entries found for the following binaries: ` +\n      `${missingPaths.join(',')}. Please
either call setWasmPaths with a ` +\n      `map providing a path for each binary, or with a string indicating ` +\n
      `the directory where all the binaries can be found.`);\n  }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/**
Used in unit tests. */\n\nexport function resetWasmPath(): void {\n  wasmPath = null;\n  wasmPathPrefix = null;\n  wasmFileMap = {};\n  customFetch = false;\n  initAborted = false;\n}\n\nlet threadsCount = -1;\nlet
actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n *
threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling
`tf.setBackend('wasm')`.\n */\n\nexport function setThreadsCount(numThreads: number) {\n  threadsCount =
numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the
backend is intialized.\n */\n\nexport function getThreadsCount(): number {\n  if (actualThreadsCount === -1) {\n
throw new Error(`WASM backend not initialized.`);\n  }\n  return actualThreadsCount;\n}\n\n"/* @license See the
LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\n\nconst version = '3.11.0';\n\nexport
{version};\n\n"/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the `License`);\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an `AS IS` BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

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=====\n
*/\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm,
init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\n\nexport {version as version_wasm} from './version';\n\nconst
WASM_PRIORITY = 2;\n\nregisterBackend('wasm', async () => {\n  const {wasm} = await init();\n  return new
BackendWasm(wasm);\n},
WASM_PRIORITY);\n\n",names":["_FusedMatMul","util","Abs","backend_util","Add","AddN","Identity","setup",
"Transpose","All","Any","wasmFunc","ArgMax","AvgPool","Reshape","BatchMatMul","slice_util","buffer","sliceI
mplCPU","Slice","BatchToSpaceND","Cast","Ceil","ClipByValue","concatImplCPU","Concat","Conv2D","Conv2
DBackpropInput","Cos","Cosh","CropAndResize","Cumsum","DepthToSpace","DepthwiseConv2dNative","Elu","s
upportsFullBroadcast","Equal","Exp","ExpandDims","Fill","FlipLeftRight","Floor","FloorDiv","FusedBatchNorm",
"FusedConv2D","FusedDepthwiseConv2D","GatherNd","GatherV2","Greater","GreaterEqual","setupFunc","Leaky
Relu","Less","LessEqual","Log","LogicalAnd","Max","Maximum","MaxPool","Mean","Min","Minimum","Mirror
Pad","Multiply","Neg","NonMaxSuppressionV3","NonMaxSuppressionV4","NonMaxSuppressionV5","kernelFunc
","NotEqual","OneHot","OnesLike","Pack","PadV2","Pow","Prelu","Prod","rangeImplCPU","Range","RealDiv","R
elu","Relu6","ResizeBilinear","Reverse","RotateWithOffset","Round","Rsqrt","ScatterNd","Select","Sigmoid","Sin
","Softmax","SpaceToBatchND","SplitV","Sqrt","Square","SquaredDifference","Step","StridedSlice","Sub","Sum",
"Tan","Tanh","Tile","TopK","Transform","Unpack","ZerosLike","registerKernel","env","require$$0","require$$1",
"require$$2","global","require$$3","require$$4","tslib_1.__extends","DataStorage","engine","KernelBackend","wa
smFactoryThreadedSimd","wasmFactory","deprecationWarn","registerBackend"],"mappings":";;;;;;;;;;;;;;
EAAA;;;;;;;;;;;;;EAIbA;EACA,IAAY,QAMX;EAND,WAAy,QAAQ;MACIB,6CAAW,CAAA;MACX,yCAAS,
CAAA;MACT,uCAAQ,CAAA;MACR,2CAAU,CAAA;MACV,iDAaA,CAAA;EAcF,CAAC,EANW,QAAQ,KAA
R,QAAQ,QAMnB;EAED;EACA,IAAY,iBAQX;EARD,WAAy,iBAaIB;MAC3B,6DAAU,CAAA;MACV,yDAA
Q,CAAA;MACR,2DAAS,CAAA;MACT,2DAAS,CAAA;MACT,mEAAa,CAAA;MACb,+DAAW,CAAA;MACX,
uDAAO,CAAA;EACT,CAAC,EARW,iBAaIB,KAAjB,iBAaIB;EC3B7B;;;;;;;;;;;;;EAuBA,IAAL,eAKQ,CAAC;
EAEb,SAAS,KAaK,CAAC,OAAoB;MACjC,eAae,GAAG,OAAO,CAAC,IAAI,CAAC,KAaK,CAACa,qBAAY,
EAAE,IAAI,aAAa;UACIE,QAAQ;UACR,OAAO;UACP,QAAQ;UACR,QAAQ;UACR,OAAO;UACP,QAAQ;UA
CR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;OACT,CA
AC,CAAC;EAcl,CAAC;EAED,SAAS,gBAagB,CAAC,IAIzB;MACQ,IAAA,oBAAM,EAAE,sBAAO,EAAE,kB

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AAK,CAAS;MAC/B,IAAA,YAAC,EAAE,YAAC,EAAE,kBAAl,EAAE,sDAAsB,CAAW;MAEpD,IAAI,CAAC,C
AAC,KAAK,KAAK,SAAS,IAAI,CAAC,CAAC,KAAK,KAAK,SAAS,EAAE;UACID,MAAM,IAAI,KAAK,CAC
X,6DAA6D,CAAC,CAAC;OACpE;MAEM,IAAA,6BAAU,EAAE,6BAAU,EAAE,6BAAU,EAAE,qCAAc,CAAU;
MACnE,IAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,
EAAE,CAAC;MAC/C,IAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,
CAAC,CAAC,EAAE,CAAC;MAE/C,IAAI,MAAM,GAAG,CAAC,CAAC;MACf,IAAI,IAAI,IAAI,IAAI,EAAE;U
AChB,IAAM,QAAQ,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,IAAI,CAAC,MAAM,CAAC,CAAC;UA
CpD,IAAI,QAAQ,CAAC,KAAK,CAAC,MAAM,KAAK,CAAC,EAAE;cAC/B,MAAM,IAAI,KAAK,CACX,iDA
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M,GAAG,QAAQ,CAAC,EAAE,CAAC;OACtB;MACD,IAAM,wBAAwB,GAAG,sBAAsB,IAAI,IAAI;UAC3D,C
AAC;UACD,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,sBAAsB,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;
MAC5D,IAAM,eAAe,GACjB,iBAAiB,CAAC,UAAkD,CAAC,CAAC;MAC1E,IAAI,eAAe,IAAI,IAAI,EAAE;UA
C3B,MAAM,IAAI,KAAK,CACR,UAAU,mDAAgD;cAC7D,sBAAsB,CAAC,CAAC;OAC7B;MAED,IAAM,OAA
O,GAAG,UAAU,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,GAAG,CAAC,CAAC,KAAK,CAAC,CAA
C,CAAC,CAAC;MACrD,IAAM,QAAQ,GAAG,UAAU,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,GAA
G,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC;MACtD,IAAM,QAAQ,GAAG,CAAC,CAAC,KAAK,CAA
C,CAAC,CAAC,CAAC;MAE5B,IAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,QAAQ,EAAE,OAA
O,EAAE,QAAQ,CAAC,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;MACvE,IAAM,KAAK,GAAG,OAAO,CAA
C,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,IAAM,WAAW,GA
AG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAK,CAAC,CAAC,MAAM,CAAC,CAAC;MACn
E,IAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAK,CAAC,CAAC,MAAM,
CAAC,CAAC;MAEnE,eAAe,CACX,GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,
GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EACIE,UAAU,EAAE,UAAU,EAAE,eAAe,E
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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.js.map

No license file was found, but licenses were detected in source scan.

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{ "version":3,"file":"StridedSlice.js","sourceRoot":"","sources":["../../src/kernels/StridedSlice.ts"],"names":[,"mappings":"AAAA;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,UAAU,EAAE,YAAY,EAAqD,IAAI,EAAC,MAAM,uBAAU B,CAAC;AAGIJ,OAAO,EAAC,OAAO,EAAC,MAAM,WAAW,CAAC;AACIC,OAAO,EAAC,KAAK,EAAC,MA AM,SAAS,CAAC;AAE9B,IAAI,gBAI8C,CAAC;AAEnD,SAAS,KAAK,CAAC,OAAoB;IACjC,gBAAgB,GAAG, OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,YAAY,EAAE,IAAI,CAAC,QAAQ,EAAE;QACjE,QAAQ;QACR,OA AO;QACP,QAAQ;QACR,OAAO;QACP,OAAO;QACP,OAAO;QACP,OAAO;QACP,OAAO;QACP,QAAQ;QAC R,QAAQ;KACT,CAAC,CAAC;AACL,CAAC;AAED,MAAM,UAAU,YAAY,CAAC,IAI5B;IACC,MAAM,EAAC ,OAAO,EAAE,MAAM,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,CAAC,EAAC,GAAG,M AAM,CAAC;IAEnB,MAAM,EACJ,KAAK,EACL,GAAG,EACH,OAAO,EACP,SAAS,EACT,OAAO,EACP,YAA Y,EACZ,WAAW,EACX,cAAc,EACf,GAAG,KAAK,CAAC;IAEV,MAAM,EACJ,gBAAgB,EACb,UAAU,EAC V,UAAU,EACV,SAAS,EACT,aAAa,EACb,KAAK,EAAE,MAAM,EACb,GAAG,EAAE,IAAI,EACT,OAAO,EA AE,QAAQ,EACIB,GACG,UAAU,CAAC,SAAS,CACb,CAAC,CAAC,KAAK,EAAE,KAAK,EAAE,GAAG,EA AE,OAAO,EAAE,SAAS,EAAE,OAAO,EAAE,YAAY,EAC9D,WAAW,EAAE,cAAc,CAAC,CAAC;IAErC,IAAI, MAAM,CAAC;IAEX,IAAI,UAAU,EAAE;QACd,iDAaiD;QACjD,MAAM,GAAG,OAAO,CAAC,EAAC,MAAM, EAAE,EAAC,CAAC,EAAC,EAAE,OAAO,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,UAAU,EAAC,EAAC,CA AC,CAAC;KACtE;SAAM,IAAI,SAAS,IAAI,aAAa,EAAE;QACrC,qEAAqE;QACrE,IAAI,CAAC,MAAM,CACP, CAAC,CAAC,KAAK,CAAC,MAAM,IAAI,CAAC,EACnB,GAAG,EAAE,CAAC,yCAAyC,CAAC,CAAC,KAAK ,CAAC,MAAM,EAAE,CAAC,CAAC;QAErE,MAAM,IAAI,GAAG,UAAU,CAAC,eAAe,CAAC,MAAM,EAAE,I AAI,EAAE,QAAQ,CAAC,CAAC;QACHe,wEAAwE;QACxE,MAAM,MAAM,GAAG,KAAK,CAAC,EAAC,MA AM,EAAE,EAAC,CAAC,EAAC,EAAE,OAAO,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,MAAM,EAAE,IAAI, EAAC,EAAC,CAAC,CAAC;QAC3E,MAAM;YACF,OAAO,CAAC,EAAC,MAAM,EAAE,EAAC,CAAC,EAAE, MAAM,EAAC,EAAE,OAAO,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,UAAU,EAAC,EAAC,CAAC,CAAC;Q ACxE,OAAO,CAAC,WAAW,CAAC,MAAM,CAAC,MAAM,CAAC,CAAC;KACpC;SAAM;QACL,MAAM,GA AG,GAAG,OAAO,CAAC,UAAU,CAAC,gBAAgB,EAAE,SAAS,CAAC,CAAC;QAE5D,MAAM,GAAG,GAAG, OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QAC/C,MAAM, aAAa,GACf,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,IAAI,CAAC,cAAc,CAAC,CAAC,CAAC,KAAK,CAAC,C AAC,CAAC,MAAM,CAAC,CAAC;QACxE,MAAM,UAAU,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,M AAM,CAAC,CAAC,MAAM,CAAC,CAAC;QACjE,MAAM,QAAQ,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CA AC,IAAI,CAAC,CAAC,MAAM,CAAC,CAAC;QAC7D,MAAM,YAAY,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU ,CAAC,QAAQ,CAAC,CAAC,MAAM,CAAC,CAAC;QAErE,MAAM,gBAAgB,GACIB,IAAI,UAAU,CAAC,IAAI ,UAAU,CAAC,gBAAgB,CAAC,CAAC,MAAM,CAAC,CAAC;QAC5D,MAAM,eAAe,GAAG,IAAI,UAAU,CACI C,IAAI,UAAU,CAAC,IAAI,CAAC,cAAc,CAAC,gBAAgB,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC;QACIE, MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE, CAAC;QAEEnD,gBAAgB,CACZ,GAAG,EAAE,aAAa,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,UAAU ,EAAE,QAAQ,EAAE,YAAY,EACtE,gBAAgB,EAAE,eAAe,EAAE,gBAAgB,CAAC,MAAM,EAAE,KAAK,CAA C,CAAC;QAEvE,MAAM,GAAG,OAAO,CAAC,EAAC,MAAM,EAAE,EAAC,CAAC,EAAE,GAAG,EAAC,EAA E,OAAO,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,UAAU,EAAC,EAAC,CAAC,CAAC;QAE1E,OAAO,CAAC, WAAW,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC;KACjC;IAED,OAAO,MAAM,CAAC;AACbB,CAAC;AAE D,MAAM,CAAC,MAAM,kBAakB,GAAiB;IAC9C,UAAU,EAAE,YAAY;IACxB,WAAW,EAAE,MAAM;IACnB ,SAAS,EAAE,KAAK;IACbB,UAAU,EAAE,YAAgC;CAC7C,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```

=====
*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,
xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n
'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', //
outShapeLength\n 'number', // outId\n ]);\n}\n\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n
inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n
newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n
sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n
      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n        newAxisMask, shrinkAxisMask);\n\n
let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x},
backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is
memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have
rank at least 1, got: ${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n
// To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape:
finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out =
backend.makeOutput(finalShapeSparse, 'float32');\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const
xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n    const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);\n    const endBytes = new Uint8Array(new
Int32Array($end).buffer);\n    const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n    const
outputShapeBytes =\n      new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n    const outStridesBytes =
new Uint8Array(\n      new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n\n    wasmStridedSlice(\n      xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n      outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n
result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n    backend.disposeData(out.dataId);\n
}\n\n  return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as {} as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/StridedSlice.js.map

```

No license file was found, but licenses were detected in source scan.

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backend-

```

```

cpu/dist/kernels/Concat_impl.js", "../src/kernels/Conv2D.ts", "../src/kernels/Conv2DBackpropInput.ts", "../src/kernels/
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LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n
int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { FusableActivation } from
'/types';\n\nlet wasmFusedMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number,\n  biasId: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,\n  null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n
```



```
*/\nimport { Abs, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport { backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\nexport\nfunction createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?:\n DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /*\n void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n ]);\n }\n\nfunction kernelFunc(args: { backend: BackendWasm, inputs: BinaryInputs }):\n TensorInfo {\n const { backend,\n inputs } = args;\n const { a, b } = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId =\n backend.dataIdMap.get(b.dataId).id;\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape =\n backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape,\n outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return\n out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes =\n new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\nconst kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if\n (supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n }\n\n const\n aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims =\n backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA &&\n loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting\n along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return\n {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n }\n\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport { Add, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
```

governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n ]);\n}\nfunction addn(args: {inputs:\n TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n{TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nexport function\nidentity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =\n args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.toArrayFromHeap(x);\n const outVals = backend.toArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as\n KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed\n * on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
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=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {identity} from\n './Identity';\nimport {CppType} from './types';\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array,\n xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>\n void;\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n ]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs,\n backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better\n // due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,\n attrs.perm);\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp = false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n if (permIsNoOp) {\n const
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cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out =
backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId =
backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n
const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n  xId,
xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n  perm.length);\n return
out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new
Array(inShape.length);\n for (let i = 0; i < outShape.length; ++i) {\n  outShape[i] = inShape[perm[i]];\n }\n
return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]
{\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n  if
(shape[i] !== 1) {\n   newShape.push(shape[i]);\n  }\n  if (shape[perm[i]] !== 1) {\n
newPerm.push(perm[i]);\n  }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n  let minValIdx = -1;\n  for (let j =
0; j < newPerm.length; ++j) {\n   if (newPerm[j] >= i &&\n      (minValIdx === -1 || newPerm[minValIdx] >
newPerm[j])) {\n    minValIdx = j;\n   }\n }\n  newPerm[minValIdx] = i;\n }\n return [newShape,
newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName:
'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright
2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
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*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null
/*void*/, ['number, number, number']);\n}\n\nfunction all(args: { backend: BackendWasm, inputs: AllInputs, attrs:
AllAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
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*\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from
'./backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose
if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n *
@param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,\n  axis: number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank =
x.shape.length;\n\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const
permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let
inputWasTransposed = false;\n  if (permutedAxes != null) {\n    const newShape: number[] = new Array(xRank);\n
for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n\n    axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({inputs: {x}, attrs: {perm:
permutedAxes}, backend});\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId =
backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n
    }\n  }\n\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n"/**\n * @license\n *
Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,\n  null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,\n  attrs: AnyAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis,\n  backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n
input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAny(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-

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core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {permuteAxesAndTranspose} from
 './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize:
 number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n  'number', // x_id\n  'number', // dtype\n  'number', // outer_size\n  'number', // inner_size\n  'number' // out_id\n  ]);\n\n  function argmax(\n    args:
  {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n    const {backend, inputs, attrs} = args;\n
    const {axis} = attrs as {} as ArgMaxAttrs;\n    const {x} = inputs as {} as ArgMaxInputs;\n    const xId =
    backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes,
    inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n
      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose
      was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId =
      transposedId;\n      }\n    }\n\n    const outShape = input.shape.slice(0, -1);\n    const out =
    backend.makeOutput(outShape, 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const outerSize =
    util.sizeFromShape(out.shape);\n    const innerSize = input.shape[axes[0]];\n    wasmFunc(inputId,
    CppDType[input.dtype], outerSize, innerSize, outId);\n\n    if (inputWasTransposed) {\n      // dispose of the
    transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    return out;\n  }\n\n  export const
  argMaxConfig: KernelConfig = {\n    kernelName: ArgMax,\n    backendName: 'wasm',\n    kernelFunc: argmax as {}
  as KernelFunc,\n    setupFunc: setup\n  };}\n\n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights
  Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you may not use this file
  except in compliance with the License.\n   * You may obtain a copy of the License at\n   *
  http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,
  software\n   * distributed under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES
  OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language
  governing permissions and\n   * limitations under the License.\n   */
  =====\n
  *\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n  xId:
  number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
  number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n
  strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n
  'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n
  'number', // padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
  strideHeight\n  'number', // strideWidth\n  'number', // channels\n  'number', // outId\n  ]);\n\n  function
  avgPool(\n    args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n    const {inputs, attrs,
  backend} = args;\n\n    const x = inputs.x as Tensor4D;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n\n    const
  {filterSize, strides, pad, dimRoundingMode} = attrs;\n    const convInfo = backend_util.computePool2DInfo(\n
  x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n    const filterHeight =
  convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n
    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft =
  convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n
    const channels = convInfo.inChannels;\n\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n
      `wasm backend does not support dataFormat: ` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n
    }\n\n    if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n      throw new Error(\n
      `was backend only supports average pooling with dilation = [1, 1], ` +\n      `got [${convInfo.dilationHeight},
  ${convInfo.dilationWidth}].`);\n    }\n\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n
    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmAvgPool(\n      xId, x.shape[0], x.shape[1], x.shape[2],
  filterHeight, filterWidth,\n      padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
  }

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outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: avgPool as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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\n
*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n  args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n\n  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old `+\n    `shape must have the same number of elements.`);\n\n  // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'wasm',\n  kernelFunc: reshape as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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\n
*/\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n\n  function batchMatMul(args: {\n    inputs: BatchMatMulInputs,\n    backend: BackendWasm,\n    attrs: BatchMatMulAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {a, b} = inputs;\n    const {transposeA, transposeB} = attrs;\n\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(\n        `BatchMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const aRank = a.shape.length;\n    const bRank = b.shape.length;\n\n    const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n    const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n    const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n    const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n    const outerDimsA = a.shape.slice(0, -2);\n    const outerDimsB = b.shape.slice(0, -2);\n\n    const batchDimA = util.sizeFromShape(outerDimsA);\n    const batchDimB = util.sizeFromShape(outerDimsB);\n\n    const batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n    util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input batch dimensions must either be the `+\n      `same or at least one input batch dimension must be 1. Got input `+\n      `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n    const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n    const outShape =\n      outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n    util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (`+\n      ` ${innerShapeB}) of Tensors with shapes

```


ZW5kQ1BVfSBmcm9tICcuLi9iYWNrZW5kX2NwdSc7XG5pbXBvcnQge2Fzc2VydE5vdENvbXBsZXh9IGZyb2
0gJy4uL2NwdV91dGlsJztcblxuZXhwb3J0IGZlbnN0aW9uIHNsaWNISW1wbChcbiAgICB2YWxzOicBYWNrZ
W5kVmFsdWVwZLCBiZWdpbjogbnVtYmVYVW10sIHNPemU6IG51bWJlcldLCBzaGFwZTogbnVtYmVYVW10sXG
4gICAgZHR5cGU6IERhdGFUeXBKIktogQmFja2VuZGFzbHVlcyB7XG4gIGNvbnN0IGlZQ29udGlub3VzID0gc2
xpY2VfdXRpbC5pc1NsaWNIQ29udGlub3VzKHNoYXBILCBiZWdpbiwgc2l6ZSk7XG4gIGNvbnN0IGxlbmd0aC
A9IHV0aWwuc2l6ZUZyb21TaGFwZShzaXplKTtcbiAgY29uc3QgeFN0cmllkXZXMgPSB1dGlsLmNvbXB1dGVtd
HJpZGVzKHNoYXBIKTtcbiAgICB2iAoaXNDb250aW5vdXMpIHtcbiAgICBjb25zdCBmbGF0T2Zmc2V0ID0gc
2xpY2VfdXRpbC5jb21wdXRIRmxhdE9mZnNldChiZWdpbiwgeFN0cmllkXZXMpO1xuXG4gICAgYWYgKGR0eX
BlID09PSAnc3RyaW5nJykge1xuICAgICAgcmV0dXJuICCh2YWxzIGFzIFVpbnQ4QXJyYXlbXSkuc2xpY2UoZmx
hdE9mZnNldCwgZmxhdE9mZnNldCArIGxlbmd0aCk7XG4gICAgfVxuXG4gICAgcmV0dXJuICCh2YWxzIGFzIF
R5cGVkQXJyYXkplLnN1YmFycmF5KGZsYXRPRmZzZXQsIGZsYXRPRmZzZXQgKyBsZW5ndGppO1xuICB9
XG5cbiAgY29uc3Qge2ZGVjb2RlZERhdGEgPSBkdHlwZSA9PT0gJ3N0cmllkZycyP1xuICAgICAgYmFja2VuZF91d
GlsLmZyb21VaW50FRvU3RyaW5nQXJyYXkodmFscyBhcYBvVaW50OEFycmF5W10pIDpobiAgICAgIHZhH
MgYXMGVHlwZWRBcnJheTtcbiAgICB2i25zdCBpbk1JiA9IGJ1ZmZlc3hzaGFwZSswZHR5cGU6IGRlY29kZW
REYXRhKTtcbiAgY29uc3Qge3V0QnVmID0gYnVmZmVYKHNPemUsIGR0eXBKIktcbiAgZm9yIChsZXQgaSA
9IDA7IGkgPCBvdXRcdWYuc2l6ZTsgeKytPksB7XG4gICAgY29uc3Qge3V0TGV9ID0gb3V0QnVmLmluZGV4V
G9Mb2MoaSk7XG4gICAgY29uc3QgaW5Mb2MgPSBvdXRmb2MubWFWKChpZG51bWJlciiwgaikgPT4ga
WR4ICsgYmVnaW5bal0pO1xuICAgIG91dEJlZi5zZXQoaW5CdWYuZ2V0KC4uLmluTG9jKSwgLi4ub3V0TG9j
KTtcbiAgfVxuXG4gIGllChkdHlwZSA9PT0gJ3N0cmllkZycyP1IHtcbiAgICB2iZR1cm4gYmFja2VuZF91dGlsLm
Zyb21TdHJpbmdBcnJheVRvVWludDob3V0QnVmLnZhHVlcyBhcYBzdHJpbmdBbXSk7XG4gIH1cbiAgcmV0d
XJuIG91dEJlZi52YWxlZmZmZmVHlwZWRBcnJheTtcbiAgICB2i1cbiAgZXhwb3J0IGZlbnN0aW9uIHNsaWNiKFxu
ICAgIGFyZ3M6IHtpbnB1dHM6IFNsaWNISW5wdXRzLCBiYWNrZW5kOibNYXRoQmFja2VuZENQVSwgYX
R0cnM6IFNsaWNIQR0cnN9KtPcbiAgICBUZW5zb3JjbmZvIHtcbiAgY29uc3Qge2luclHV0cywgeYmFja2VuZC
wgYXR0cnN9ID0gYXJncztcbiAgY29uc3Qge3h9ID0gaW5wdXRzO1xuICB2i25zdCB7YmVnaW5sIHNPemV9ID
0gYXR0cnM7XG5cbiAgYXNzZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcbiAgICB2i25zdCBbJGJlZ2luLCAk
c2l6ZV0gPSBzbGljZV91dGlsLnBhcniU2xpY2VQYXJhbXMOeCwgYmVnaW5sIHNPemUpO1xuICBzbGljZV9
1dGlsLmFzc2VydFBhcmtFc1ZhbGlkKHgsICRiZWdpbiwgeJHNpemUpO1xuXG4gIGNvbnN0IHZhbHMgPSBiYW
NrZW5kLmRhGEuZ2V0KHguZGF0YUlKKS52YWxlZmZmZmZmXG4gIGNvbnN0IG91dFZhbHMgPSBzbGljZUlucG
wodmFscywgJGJlZ2luLCAk2l6ZSwgeC5zaGFwZSwgeC5kdHlwZSk7XG4gIHJldHVybiBiYWNrZW5kLm1ha2
VUZW5zb3JjbmZvKCRzaXplLCB4LmR0eXBILCBvdXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN

IQR29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZXJuZwXDb25maWcgc29uc3QgZm9vZXRwYmVzktcbiAgICB2i1cbiAgZXhwb3J0IGNvbnN0IHNSaWN

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*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {sliceImplCPU} from
 './kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:
BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] =
slice_util.parseSliceParams(x, begin, size);\n\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,
size_);\n\n  const xVals = backend.readSync(x.dataId);\n\n  const out = backend.makeOutput(size_, x.dtype);\n\n  const
xStrides = util.computeStrides(x.shape);\n\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinuous)
{\n  const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n  if (x.dtype === 'string') {\n
outData.stringBytes =\n    (xVals as Uint8Array[]).\n    slice(flatOffset, flatOffset +
```

```

util.sizeFromShape(size_));\n } else {\n   const outVals = backend.toArrayFromHeap(out);\n   outVals.set(\n     (xVals as TypedArray)\n     .subarray(flatOffset, flatOffset +\n   util.sizeFromShape(size_));\n   }\n   return out;\n }\n if (x.dtype === 'string') {\n   const res =\n   sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n   outData.stringBytes = res as Uint8Array[];\n   return\n   out;\n }\n const outVals = backend.toArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2)\n {\n   slice2d(\n     xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n     size_ as [number, number]);\n } else if (rank === 3) {\n   slice3d(\n     xVals as TypedArray, xStrides[0], xStrides[1],\n     outVals,\n     begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)\n {\n   slice4d(\n     xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n     begin_ as [number,\n     number, number, number],\n     size_ as [number, number, number, number]);\n } else {\n   const res =\n   sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n   outVals.set(res);\n }\n return\n   out;\n }\n\nfunction slice2d(\n  xVals: backend_util.TypedArray, xStride: number,\n  outVals:\n  backend_util.TypedArray, begin: [number, number],\n  size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI;\n  i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]),\n    outOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n  xVals: backend_util.TypedArray, xStride1:\n  number, xStride2: number,\n  outVals: backend_util.TypedArray, begin: [number, number, number],\n  size:\n  [number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i <\n  endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n  xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n  xStride3:\n  number, outVals: backend_util.TypedArray,\n  begin: [number, number, number, number],\n  size: [number,\n  number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK\n  + size[2];\n  const beginL = begin[3];\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++)\n    {\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +\n        beginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n *  

=====*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,\nKernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n{ reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction\nbatchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: BackendWasm,\n  attrs:\n  BatchToSpaceNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockSize,\n  crops } = attrs;\n\n  const prod = blockSize.reduce((a, b) => a * b);\n  const reshaped =\n  backend_util.getReshaped(x.shape, blockSize, prod);\n  const permuted =\n  backend_util.getPermuted(reshaped.length, blockSize.length);\n  const reshapedPermuted =\n  backend_util.getReshapedPermuted(x.shape, blockSize, prod);\n  const sliceBeginCoords =\n  backend_util.getSliceBeginCoords(crops, blockSize.length);\n  const sliceSize =\n  backend_util.getSliceSize(reshapedPermuted, crops, blockSize.length);\n  const xReshaped = reshape({ inputs:

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{x}, backend, attrs: {shape: reshaped});\n const xTransposed =\n  transpose({inputs: {x: xReshaped}, backend,\n  attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n  {inputs: {x: xTransposed}, backend,\n  attrs: {shape: reshapedPermuted}});\n const result = slice({\n  inputs: {x: xTransposedReshaped},\n  backend,\n  attrs: {begin: sliceBeginCoords, size: sliceSize}\n  });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return\n result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function\n cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm};\n  TensorInfo {\n  const {inputs:\n  {x}, attrs: {dtype}, backend} = args;\n  const out = backend.makeOutput(x.shape, dtype);\n  const inVals =\n  backend.toArrayFromHeap(x);\n  const outVals = backend.toArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

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*\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =\n  backend.wasm.cwrap(ClipByValue, null /* void */, [\n  'number', // x_id\n  'number', // min\n  'number', //\n  max\n  'number' // out_id\n  ]);\n\n  function clip(args: {\n  inputs: ClipByValueInputs,\n  backend:\n  BackendWasm,\n  attrs: ClipByValueAttrs\n  }) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {clipValueMin, clipValueMax} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =\n  backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmClip(xId,\n  clipValueMin, clipValueMax, outId);\n  return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n  kernelName: ClipByValue,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: clip as {} as\n  KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed\n * on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

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*\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/*\n *

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=====\n*\n\nimport { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { concatImplCPU } from\n './kernel_utils/shared';\nimport { identity } from './Identity';\nimport { reshape } from './Reshape';\n\nexport function\n concat(\n  args: { inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs } ) {\n  const { inputs, backend }\n  = args;\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n  let outShape =\n  backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n  // Keep only non-empty tensors (ignore tensors\n  with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n  if ($inputs.length ===\n  1) {\n    return identity({ inputs: { x: $inputs[0] }, backend });\n  }\n  const out = backend.makeOutput(outShape,\n  inputs[0].dtype);\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n  const shapes =\n  $inputs.map(t => t.shape);\n  backend_util.assertParamsConsistent(shapes, axis);\n  if ($inputs[0].dtype ===\n  'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-\n    dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors into those less than\n    // axis to be concatenated and the rest. Then reshape the tensors\n    // into a two-dimensional tensor by\n    collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n    // the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize =\n      util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({ inputs: { x: t },\n      backend, attrs: { shape } });\n    });\n    const inputsValShapes = inputs2D.map(t => {\n      return { vals:\n      backend.readSync(t.dataId), shape: t.shape };\n    });\n    // Concat 2d tensors along axis=1.\n    outShape =\n    backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n    const simplyConcat =\n    inputs2D[0].shape[0] === 1;\n    const outVals = concatImplCPU(\n      inputsValShapes, outShape,\n      inputs[0].dtype,\n      simplyConcat) as string[];\n    const finalOutShape =\n    backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n    out.shape = finalOutShape;\n    const\n    outData = backend.dataIdMap.get(out.dataId);\n    outData.stringBytes =\n    backend_util.fromStringArrayToUint8(outVals);\n    inputs2D.forEach(t => backend.disposeData(t.dataId));\n    return out;\n  }\n  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n  let sumInnerDims =\n  0;\n  const innerDims = $inputs.map(input => {\n    const innerDim = util.sizeFromShape(input.shape.slice(axis));\n    sumInnerDims += innerDim;\n    return innerDim;\n  });\n  const inVals = $inputs.map(input =>\n  backend.typedArrayFromHeap(input));\n  const outVals = backend.typedArrayFromHeap(out);\n  for (let b = 0; b <\n  batchDim; b++) {\n    let outOffset = b * sumInnerDims;\n    for (let i = 0; i < inVals.length; i++) {\n      const\n      innerDim = innerDims[i];\n      const inOffset = b * innerDim;\n      const vals = inVals[i].subarray(inOffset,\n      inOffset + innerDim);\n      outVals.set(vals, outOffset);\n      outOffset += innerDim;\n    }\n  }\n  return\n  out;\n}\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as { } as KernelFunc,\n};\n\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n\n=====\n*\n\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype,
```



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=== 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n     `wasm backend
Conv2D does not support dataFormat:` +\n     `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n   filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: conv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride:
number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n ]);\n}\n\nfunction conv2DBackpropInput(args: {\n  backend:
BackendWasm,\n  inputs: Conv2DBackpropInputInputs,\n  attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const { backend, inputs, attrs } = args;\n const { dy, filter } = inputs;\n const { strides, pad, dataFormat,
dimRoundingMode, inputShape } = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n  dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n  batchSize,\n  filterHeight,\n  filterWidth,\n  inChannels,\n
inHeight,\n  inWidth,\n  outChannels,\n  outHeight,\n  outWidth,\n  strideHeight,\n  strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n

```



```
wasmConv2DBackpropInput(\n    dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n    inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n    topPad, leftPad, fltS0, fltS1, fltS2,\n    xBatchStride, xRowStride,\n    xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n    yChannelStride, outId);\n    return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n    kernelName: Conv2DBackpropInput,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:\n    conv2DBackpropInput as { } as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,\n    TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n    bilinear = 0,\n    nearest = 1\n}\n\nlet wasmCropAndResize: (\n    imagesId: number, boxesId: number, boxIndId: number, numBoxes:\n    number,\n    imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n    method: number,\n    extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n    wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n        'number', // imagesId\n        'number', // boxesId\n        'number', // boxIndId\n        'number', // numBoxes\n        'array', // images shape\n        'number', // cropHeight\n        'number', // cropWidth\n        'number', // method\n        'number', // extrapolation value\n        'number' // out id\n    ]);\n\n    function cropAndResize(args: {\n        backend: BackendWasm,\n        inputs: CropAndResizeInputs,\n        attrs: CropAndResizeAttrs\n    }): TensorInfo {\n        const {backend, inputs, attrs} = args;\n        const {method, extrapolationValue, cropSize} = attrs;\n        const {image, boxes, boxInd} = inputs;\n        const numBoxes = boxes.shape[0];\n        const [cropHeight, cropWidth] = cropSize as [number, number];\n        const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n        let imagesData = backend.dataIdMap.get(image.dataId);\n        let castedData;\n        if (image.dtype !== 'float32') {\n            castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n            imagesData = backend.dataIdMap.get(castedData.dataId);\n        }\n        const imagesId = imagesData.id;\n        const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n        const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n        const out = backend.makeOutput(outShape, 'float32');\n        const outId = backend.dataIdMap.get(out.dataId).id;\n        const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n        wasmCropAndResize(\n            imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n            cropWidth,\n            InterpolationMethod[method as { } as keyof typeof InterpolationMethod],\n            extrapolationValue, outId);\n        if (castedData !== null) {\n            backend.disposeData(castedData.dataId);\n        }\n        return out;\n    }\n\n    export const cropAndResizeConfig: KernelConfig = {\n        kernelName: CropAndResize,\n        backendName: 'wasm',\n        setupFunc: setup,\n        kernelFunc: cropAndResize as { } as KernelFunc\n    };\n\n    ", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
```

\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nimport {transpose} from './Transpose';\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n finalDim: number, outId: number, dtype: CppDType) => void;\nfunction setup(backend: BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n 'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n 'number' // dtype\n ]);\n}\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n permutedOutId, CppDType[x.dtype]);\n // transpose data back if permuted\n let out = permutedOut;\n if (permutation !== null) {\n const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {\n KernelFunc\n };,\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmDepthToSpace:
```

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(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction\nsetup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null\n/*void*/, [\n  'number', // xId\n  'number', // blockSize\n  'number', // channelsLast\n  'array', // xStrides\n  'number', // xStridesLength\n  'array', // outputShape\n  'array', // outputStrides\n  'number', // outSize\n  'number', // outId\n  ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs: DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth = inputDepth / (blockSize * blockSize);\n\n  const outputShape = (dataFormat === 'NHWC') ?\n    [batchSize, outputHeight, outputWidth, outputDepth] :\n    [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const out = backend.makeOutput(outputShape, 'float32');\n  const xData = backend.dataIdMap.get(x.dataId);\n  const xId = xData.id;\n  const xStridesBytes =\n    new Uint8Array(new\nInt32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new\nInt32Array(outputShape).buffer);\n  const outStridesBytes =\n    new Uint8Array(new\nInt32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  wasmDepthToSpace(\n    xId, blockSize, channelsLast,\n    xStridesBytes, x.shape.length - 1,\n    outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n  return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,\nDepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from './backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,\n  inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop:\nnumber,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight:\nnumber, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number,\n  outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n    backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n    'number', //\n  xId\n  'number', // batchSize\n  'number', // inputHeight\n  'number', // inputWidth\n  'number', //\n  filterId\n  'number', // filterHeight\n  'number', // filterWidth\n  'number', // padTop\n  'number', //\n  padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', // isSamePad\n  'number', //\n  dilationHeight\n  'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number', // inputChannels\n  'number', // outputChannels\n  'number', // outId\n  ]);\n}\n\nfunction\ndepthwiseConv2d(args: {\n  inputs: DepthwiseConv2dNativeInputs,\n  backend: BackendWasm,\n  attrs: DepthwiseConv2dNativeAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter} = inputs;\n  const\n  xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const\n  {strides, dilations, pad, dimRoundingMode} = attrs;\n  const $dilations = dilations === null ? [1, 1] : dilations;\n  const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape,\n    strides,\n    ($dilations as number | [number, number]), pad, dimRoundingMode,\n    true /* depthwise */);\n}

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const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop =
convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n     `wasm backend DepthwiseConv2dNative
does not support dataFormat: ` +\n     `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n   filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n  kernelName: DepthwiseConv2dNative,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nexport function expandDims(args: {\n  inputs: ExpandDimsInputs,\n  attrs: ExpandDimsAttrs,\n  backend: BackendWasm\n}) {\n  const {inputs, attrs, backend} = args;\n  const {input} = inputs;\n  const {dim} =
attrs;\n\n  const inputRank = input.shape.length;\n  const newShape = input.shape.slice();\n  let $dim = dim;\n  if
(dim < 0) {\n    // Negative value is counted from the tail of rank.\n    util.assert(\n      -(inputRank + 1) <= dim,\n      () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n        inputRank}]`);\n    $dim = inputRank + dim
+ 1;\n  }\n  newShape.splice($dim, 0, 1);\n\n  return reshape({inputs: {x: input}, backend, attrs: {shape:
newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n  kernelName: ExpandDims,\n  backendName: 'wasm',\n  kernelFunc: expandDims as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {Fill, FillAttrs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function fill(args: {attrs:
FillAttrs, backend: BackendWasm}) {\n  const {attrs: {shape, value, dtype}, backend} = args;\n  const out =
backend.makeOutput(shape, dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(value as
number);\n  return out;\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName:
'wasm',\n  kernelFunc: fill as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====
*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch:
number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', //
imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n
const {image} = inputs;\n\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId =
backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch,
imageHeight, imageWidth, numChannels] = image.shape;\n\n  wasmFlipLeftRight(\n    imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'wasm',\n  kernelFunc: flipLeftRight as {} as
KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
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```
=====\n\n*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number', 'number', 'number', 'number', 'number'];\n  );\n\n  function fusedBatchNorm(args: {\n    backend: BackendWasm,\n    inputs: FusedBatchNormInputs,\n    attrs: FusedBatchNormAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {varianceEpsilon} = attrs;\n    const {x, mean, variance, offset, scale} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const meanId = backend.dataIdMap.get(mean.dataId).id;\n    const varianceId = backend.dataIdMap.get(variance.dataId).id;\n    const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n    const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(x.shape) === 0) {\n      return out;\n    }\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmBatchNorm(xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n    return out;\n  }\n\n  export const fusedBatchNormConfig: KernelConfig = {\n    kernelName: FusedBatchNorm,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: fusedBatchNorm as {\n      KernelFunc\n    };,\n  }, "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *"
```

```
=====\n\n*\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *"
```

```
=====\n\n*\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from '../binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const floorDivConfig: KernelConfig =\n  createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *"
```

```
=====\n\n*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport
```

```

{FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n  (xId: number, batchSize: number, inputHeight:\n  number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number,\n  padTop: number, padRight: number, padBottom: number,\n  padLeft: number, isSamePad: number,\n  dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels: number, activation: number,\n  preluActivationWeightsId: number,\n  leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', // preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\n  function\n  fusedConv2d(args: {\n    inputs: FusedConv2DInputs,\n    backend: BackendWasm,\n    attrs: FusedConv2DAttrs\n  })\n  {\n    const {inputs, attrs, backend} = args;\n    const {x, filter, bias, preluActivationWeights} = inputs;\n    const {\n      strides,\n      pad,\n      dilations,\n      dataFormat,\n      dimRoundingMode,\n      activation,\n      leakyreluAlpha\n    } =\n      attrs;\n\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as\n      Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode);\n\n    const fusedActivation =\n      FusableActivation[activation as {}] as keyof typeof FusableActivation;\n\n    if (fusedActivation == null) {\n      throw\n      new Error(\n        ` ${activation} activation not yet supported for FusedConv2D ` +\n        ` in the wasm backend.`);\n    }\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId =\n      backend.dataIdMap.get(filter.dataId).id;\n\n    const outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n\n    if (bias != null) {\n      const biasData = backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `FusedConv2D only supports rank-1 bias but got ` +\n          ` rank\n          ${biasData.shape.length}.`);\n      }\n      if (biasData.shape[0] !== outputChannels) {\n        throw new Error(\n          `FusedConv2D bias shape (${biasData.shape}) does not ` +\n          ` match the number of output channels\n          (${outputChannels}).`);\n      }\n      biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const\n    filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight =\n      convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const\n    strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =\n      convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize =\n      convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if\n    (dataFormat !== 'NHWC') {\n      throw new Error(\n        ` wasm backend FusedConv2D does not support\n        dataFormat:` +\n        ` ${dataFormat}'. Please use 'NHWC'.`);\n    }\n\n    const out =\n      backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const\n    preluActivationWeightsId = preluActivationWeights == null ?\n      0 :\n      backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n    wasmFusedConv2d(\n      xId, batchSize, inHeight,\n      inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight,\n      dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n      fusedActivation,\n      preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n    return out;\n  }\n\n  export const fusedConv2DConfig:\n  KernelConfig = {\n    kernelName: FusedConv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:\n    fusedConv2d as {} as KernelFunc\n  };
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```
=====\n*\n\nimport { backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,  
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\nimport  
{ BackendWasm } from './backend_wasm';\nimport { FusibleActivation } from './types';\n\nlet  
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:  
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:  
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //  
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //  
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //  
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //  
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //  
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\n  function  
fusedDepthwiseConv2d(args: {\n    inputs: FusedDepthwiseConv2DInputs,\n    backend: BackendWasm,\n    attrs:  
FusedDepthwiseConv2DAttrs\n  }) {\n    const { inputs, attrs, backend } = args;\n    const { x, filter, bias,  
preluActivationWeights } = inputs;\n    const {\n      strides,\n      pad,\n      dilations,\n      dataFormat,\n      dimRoundingMode,\n      activation,\n      leakyreluAlpha\n    } = attrs;\n\n    const convInfo =  
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, true /* depthwise */);\n\n    const fusedActivation =\n      FusibleActivation[activation as {\n        as keyof typeof FusibleActivation\n      }];\n    if (fusedActivation == null) {\n      throw new Error(\n        `${activation}\n        activation not yet supported for FusedDepthwiseConv2D`\n        +\n        `in the wasm backend.`);\n    }\n\n    const xId =  
backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const  
outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n    if (bias != null) {\n      const biasData =  
backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `FusedDepthwiseConv2D only supports rank-1 bias but got`\n          +\n          `rank ${biasData.shape.length}`);\n      }\n      if (biasData.shape[0] !== outputChannels) {\n        throw new Error(\n          `FusedDepthwiseConv2D bias shape\n          (${biasData.shape}) does not`\n          +\n          `match the number of output channels (${outputChannels})`);\n      }\n      biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =  
convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const  
padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight =  
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight =  
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =  
convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize =  
convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if  
(dataFormat !== 'NHWC') {\n      throw new Error(\n        `wasm backend FusedDepthwiseConv2D does not support  
dataFormat:`\n        +\n        `${dataFormat}`. Please use 'NHWC'.`);\n    }\n\n    const out =  
backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const  
preluActivationWeightsId = preluActivationWeights == null ?\n      0 :  
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n    wasmFusedDepthwiseConv2d(\n      xId, batchSize,  
inHeight, inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft,  
isSamePad, dilationHeight,\n      dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n      fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n    return out;\n  }\n\n  export const  
fusedDepthwiseConv2DConfig: KernelConfig = {\n    kernelName: FusedDepthwiseConv2D,\n    backendName:
```


'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\"));\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nlet
wasmGatherNd: (\n  xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n  sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'number', // indicesId\n  'number', // numSlices\n  'number', // sliceRank\n  'number', //
sliceSize\n  'array', // strides\n  'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} =
inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params,
indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n    return
out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n  const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData =
backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmGatherNd(\n    xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n    stridesBytes,
outId);\n\n  return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\"));\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====
*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nimport {CppType} from './types';\n\nlet wasmGather:
(\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize:
number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'array', //
xStrides\n  'number', // stridesSize\n  'number', // indicesId\n  'number', // batchSize\n  'array', //
outStrides\n  'number' // outId\n  ]);\n}\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x,
indices} = inputs;\n  const {axis, batchDims} = attrs;\n\n  // Throw error when any index is out of bound.\n  const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n    const index
= indicesVals[i];\n    util.assert(\n      index <= axisDim - 1 && index >= 0,\n      () =>\n        `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]);\n  }\n\n  const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n    x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n  const flattenX = reshape({\n    inputs: {x},\n    attrs: {\n      shape: [\n        shapeInfo.batchSize,
```

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shapeInfo.outerSize, shapeInfo.dimSize,\n    shapeInfo.sliceSize\n    ]\n },\n backend\n });\n const
indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape =
[\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n ];\n\n
const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n }\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n", "/**\n
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copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from
'/types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
out_id\n ]);\n\n\nexport function leakyRelu(\n args: {\n inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm});\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either
float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape)
!== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha,
outId);\n }\n\n return out;\n }\n\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n
backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as { } as KernelFunc,\n};\n", "/**\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n", "/**\n
* @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n  createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {reductionIndices: axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      input = transposed;\n      inputId = transposedId;\n    }\n\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n    const reduceSize =\n      util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmMax(inputId, CCppType[x.dtype], reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    return out;\n  }\n\n  export const maxConfig: KernelConfig = {\n    kernelName: Max,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: max as {} as KernelFunc\n  };\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n  createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
```

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport { KernelConfig, LessEqual } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const lessEqualConfig: KernelConfig =\n\ncreateBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n\n"/**\n\n * @license\n\n * Copyright 2019\n\n * Google LLC. All Rights Reserved.\n\n * Licensed under the Apache License, Version 2.0 (the "License");\n\n * you may not use this file except in compliance with the License.\n\n * You may obtain a copy of the License at\n\n * http://www.apache.org/licenses/LICENSE-2.0\n\n * Unless required by applicable law or agreed to in writing,\n\n * software\n\n * distributed under the License is distributed on an "AS IS" BASIS,\n\n * WITHOUT WARRANTIES\n\n * OR CONDITIONS OF ANY KIND, either express or implied.\n\n * See the License for the specific language\n\n * governing permissions and\n\n * limitations under the License.\n\n *
```

```
=====\n\n*\n\nimport { KernelConfig, Log } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n\n"/**\n\n * @license\n\n * Copyright 2019 Google LLC. All Rights Reserved.\n\n * Licensed under the Apache License, Version 2.0 (the\n\n * "License");\n\n * you may not use this file except in compliance with the License.\n\n * You may obtain a copy of the\n\n * License at\n\n * http://www.apache.org/licenses/LICENSE-2.0\n\n * Unless required by applicable law or\n\n * agreed to in writing, software\n\n * distributed under the License is distributed on an "AS IS" BASIS,\n\n * WITHOUT WARRANTIES\n\n * OR CONDITIONS OF ANY KIND, either express or implied.\n\n * See the License for\n\n * the specific language governing permissions and\n\n * limitations under the License.\n\n *
```

```
=====\n\n*\n\nimport { KernelConfig, LogicalAnd } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const logicalAndConfig: KernelConfig =\n\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n\n"/**\n\n * @license\n\n * Copyright 2019\n\n * Google LLC. All Rights Reserved.\n\n * Licensed under the Apache License, Version 2.0 (the "License");\n\n * you may not use this file except in compliance with the License.\n\n * You may obtain a copy of the License at\n\n * http://www.apache.org/licenses/LICENSE-2.0\n\n * Unless required by applicable law or agreed to in writing,\n\n * software\n\n * distributed under the License is distributed on an "AS IS" BASIS,\n\n * WITHOUT WARRANTIES\n\n * OR CONDITIONS OF ANY KIND, either express or implied.\n\n * See the License for the specific language\n\n * governing permissions and\n\n * limitations under the License.\n\n *
```

```
=====\n\n*\n\nimport { backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util }\n\nfrom '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmMaxPool: (\n\n xId:\n\n number, batchSize: number, inputHeight: number, inputWidth: number,\n\n filterHeight: number, filterWidth:\n\n number, padTop: number, padRight: number,\n\n padBottom: number, padLeft: number, dilationHeight: number,\n\n dilationWidth: number, strideHeight: number, strideWidth: number,\n\n inputChannels: number, outputChannels:\n\n number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n\n wasmMaxPool =\n\nbackend.wasm.cwrap(MaxPool, null /* void */, [\n\n 'number', // xId\n\n 'number', // batchSize\n\n 'number', //\n\n inputHeight\n\n 'number', // inputWidth\n\n 'number', // filterHeight\n\n 'number', // filterWidth\n\n 'number', //\n\n padTop\n\n 'number', // padRight\n\n 'number', // padBottom\n\n 'number', // padLeft\n\n 'number', //\n\n dilationHeight\n\n 'number', // dilationWidth\n\n 'number', // strideHeight\n\n 'number', // strideWidth\n\n 'number', //\n\n inputChannels\n\n 'number', // outputChannels\n\n 'number', // outId\n\n ]);\n\n}\n\nfunction maxPool(\n\n args:\n\n {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n\n const {inputs, attrs, backend} =\n\nargs;\n\n const x = inputs.x as Tensor4D;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API\n\n supports int32 input. CPU and WebGL backend also support int32\n\n // input. WASM backend doesn't support it\n\n because it uses xnpack which only\n\n // supports float32.\n\n // Add the following assert only for the WASM\n\n backend instead of at core op\n\n // level.\n\n // TODO: add support for int32 input.\n\n util.assert(\n\n x.dtype
```

```

=== 'float32',\n    () =>\n        `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`; \n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n    `wasm
backend does not support dataFormat: ` +\n    `${convInfo.dataFormat}`. Please use 'channelsLast'.`); \n } \n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
===== \n
*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n  backend.wasm.cwrap(Mean, null /*void*/, [number, number, number]);\n}\n\nexport function mean(\n  args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs};\n  TensorInfo {\n    const {backend, inputs,
attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if
(inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId
!== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input =
transposed;\n        inputId = transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n      }\n    }\n\n    backend_util.assertAxesAreInnerMostDims(\n      'mean',
reductionAxes, input.shape.length);\n    const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize =

```

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util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n  castedInput =\n  cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n  inputId =\n  backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if\n (util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n  // dispose of the transposed\n  tensor.\n  backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n  // reshape\n  const newShape =\n  backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n }\n\n if (input.dtype\n !== 'float32') {\n  backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:\n KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: mean as { }\n  as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *

```

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=====\n\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:\n number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n  'number', // x_id\n  'number', // dtype\n  'number', // reduce_size\n  'number', // out_id\n  ]);\n}\n\nfunction min(args: {backend:\n BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let\n  inputId = xId;\n  let input = x;\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n  permuteAxesAndTranspose(x, axis, backend);\n  if (inputWasTransposed) {\n    const transposedId =\n    backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We\n      will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n    }\n  }\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('min', axes,\n  inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape,\n  axes);\n  const reduceSize = util.sizeFromShape(reduceShape);\n  const out = backend.makeOutput(outShape,\n  input.dtype);\n  if (util.sizeFromShape(input.shape) !== 0) {\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n    wasmMin(inputId, CCppType[x.dtype], reduceSize, outId);\n  }\n\n  if\n  (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape = backend_util.expandShapeToKeepDim(out.shape,\n    originalAxes);\n    out.shape = newShape;\n  }\n\n  return out;\n}\n\nexport const minConfig: KernelConfig = {\n  kernelName: Min,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: min as { }\n  as\n  KernelFunc\n};\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *

```

```

=====\n\n\n*\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-\n core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\n// Must match

```

```

enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-
paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n ]);\n}\n\nfunction
mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const
{inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /*
beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =
backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat =
paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const
postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes,
MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc:
setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*/\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\ncreateBinaryKernelConfig(Minimum, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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```

=====\n
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n
'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n
]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs:
NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold,
maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n

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// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor
=\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as { } as
KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\ncreateBinaryKernelConfig(Multiply, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2020 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n", "/*\n * @license\n
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the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { BackendWasm } from '../backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`\n\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n
pSelectedScores: number;\n pValidOutputs: number;\n}\n\n/*\n * Parse the result of the c++ method, which has the
shape equivalent to\n * `Result`.\n */\n\nexport function parseResultStruct(\n backend: BackendWasm, resOffset:
number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const
pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const
pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n
backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores,
pValidOutputs};\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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License.\n *
=====\n

```



```

*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV4,\n    'number', // Result*\n    [\n      'number', // boxesId\n
      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', //
scoreThreshold\n      'bool', // padToMaxOutputSize\n    ]);\n\n  function nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n  inputs: NonMaxSuppressionV4Inputs,\n  attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize } =\n      attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const
resOffset = wasmFunc(\n      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n
parseResultStruct(backend, resOffset);\n\n    // Since we are not using scores for V4, we have to delete it from the
heap.\n    backend.wasm._free(pSelectedScores);\n\n    const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n    const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n    return [selectedIndicesTensor,
validOutputsTensor];\n\n  }\n\n  export const nonMaxSuppressionV4Config: KernelConfig = {\n    kernelName:
NonMaxSuppressionV4,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n  };
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```

```

=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n  number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n      'number', // boxesId\n
      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', //
scoreThreshold\n      'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n backend:
BackendWasm,\n  inputs: NonMaxSuppressionV5Inputs,\n  attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[]
{\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma
} =\n      attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n
const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n\n    const { pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n    backend.wasm._free(pValidOutputs);\n\n    const
selectedIndicesTensor =\n      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n    const
selectedScoresTensor =\n      backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n    return
[selectedIndicesTensor, selectedScoresTensor];\n\n  }\n\n  export const nonMaxSuppressionV5Config: KernelConfig =
{\n    kernelName: NonMaxSuppressionV5,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: kernelFunc
as { } as KernelFunc,\n  };
\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed

```

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```
=====  
*\n\nimport { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-core';  
\nimport { BackendWasm } from './backend_wasm';  
\nlet wasmOneHot: (\n  indicesId: number, depth: number, onValue: number, offValue: number,  
  outId: number) => void;  
\nfunction setup(backend: BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id  
    'number', // depth,  
    'number', // onValue  
    'number', // offValue  
    'number' // out_id  
  ]);  
\n  function oneHot(\n    args: { inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm }) {\n    const { inputs, backend, attrs } = args;  
    const { indices } = inputs;  
    const { depth, onValue, offValue } = attrs;  
    const out = backend.makeOutput([...indices.shape, depth], 'int32');  
    const outId = backend.dataIdMap.get(out.dataId).id;  
    const indicesData = backend.dataIdMap.get(indices.dataId);  
    const indicesId = indicesData.id;  
    wasmOneHot(indicesId, depth, onValue, offValue, outId);  
    return out;  
  }  
\n  export const oneHotConfig:  
  KernelConfig = {\n    kernelName: OneHot,  
    backendName: 'wasm',  
    setupFunc: setup,  
    kernelFunc: oneHot as  
    {} as KernelFunc,  
  };  
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   */  
}
```

```
=====  
*\n\nimport { KernelConfig, NotEqual } from '@tensorflow/tfjs-core';  
\nimport { createBinaryKernelConfig } from './binary_kernel';  
\nconst supportsFullBroadcast = false;  
\nexport const notEqualConfig: KernelConfig =  
  createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');  
  /**  
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   * See the License for the specific language governing permissions and  
   * limitations under the License.  
   */  
}
```

```
=====  
*\n\nimport { KernelConfig, KernelFunc, OnesLike, OnesLikeInputs } from '@tensorflow/tfjs-core';  
\nimport { BackendWasm } from './backend_wasm';  
\nfunction onesLike(args: { inputs: OnesLikeInputs, backend: BackendWasm }) {\n  const { inputs: { x }, backend } = args;  
  const out = backend.makeOutput(x.shape, x.dtype);  
  const outVals = backend.typedArrayFromHeap(out);  
  outVals.fill(1);  
  return out;  
}  
\nexport const onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,  
  backendName: 'wasm',  
  kernelFunc: onesLike as  
  {} as KernelFunc,  
};  
  /**  
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   * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.  
   * See the License for the specific language governing permissions and  
   * limitations under the License.  
   */  
}
```

```

=====
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';
\nimport {BackendWasm} from './backend_wasm';
\nimport {concat} from './Concat';
\nimport {expandDims} from './ExpandDims';
\n\nexport function pack(\n  args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):
\n  TensorInfo {\n    const {inputs, backend, attrs} = args;
\n    const {axis} = attrs;
\n\n    if (inputs.length === 1) {\n      return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});
\n    }\n\n    const shape = inputs[0].shape;
\n    const dtype = inputs[0].dtype;
\n\n    inputs.forEach(t => {\n      util.assertShapesMatch(\n        shape, t.shape,
\n        'All tensors passed to stack must have matching shapes');
\n      util.assert(\n        dtype === t.dtype,
\n        () => 'All tensors passed to stack must have matching dtypes');
\n    });
\n\n    const intermediateTensorInfos: TensorInfo[] = [];
\n    const expandedTensors = inputs.map(t => {\n      const expandedT =
\n        expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});
\n      intermediateTensorInfos.push(expandedT);
\n      return expandedT;
\n    });
\n\n    const result = concat({inputs: expandedTensors, backend, attrs: {axis}});
\n\n    intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));
\n\n    return result;
\n  }\n\nexport const packConfig: KernelConfig = {\n  kernelName: Pack,
\n  backendName: 'wasm',
\n  kernelFunc: pack as {} as KernelFunc\n};
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=====

```

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=====
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';
\nimport {BackendWasm} from './backend_wasm';
\nimport {fill} from './Fill';
\nimport {CppType} from './types';
\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,
\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,
\n  constantValue: number, outId: number) => void;
\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n  ]);
\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;
\n\n  const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);
\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-circuit the computation, since x doesn't have value, only\n    // the shape is used to compute output shape to pad.\n    return fill({\n      backend,
\n      attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n    });
\n  }\n\n  const xId = backend.dataIdMap.get(x.dataId).id;
\n  const out = backend.makeOutput(outShape, x.dtype);
\n  const outTensorData = backend.dataIdMap.get(out.dataId);
\n  const outId = outTensorData.id;
\n\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);
\n  const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);
\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);
\n  const prePaddingsBytes = new Uint8Array(new Int32Array(prePaddingsFlat).buffer);
\n  const postPaddingsBytes = new Uint8Array(new Int32Array(postPaddingsFlat).buffer);
\n\n  wasmPadV2(xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes, postPaddingsBytes, constantValue, outId);
\n  return out;
\n}\n\nexport const padV2Config: KernelConfig = {\n  kernelName: PadV2,
\n  backendName: 'wasm',
\n  kernelFunc: pad as {} as KernelFunc,
\n  setupFunc: setup\n};
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```
=====\n*\n\nimport { KernelConfig, KernelFunc, Prelu, PreluInputs } from '@tensorflow/tfjs-core';\nimport\n{ BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\n\nlet wasmPrelu: (xId: number,\nweightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu =\nbackend.wasm.cwrap(Prelu, null /* void */, [\n  'number', // x_id\n  'number', // weights_id\n  'number' //\nout_id\n  ]);\n\n  function prelu(args: { inputs: PreluInputs, backend: BackendWasm }) {\n    const { inputs, backend\n} = args;\n    const { x, alpha } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId =\nbackend.dataIdMap.get(alpha.dataId).id;\n\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if\n(input.dtype !== 'float32') {\n      castedInput = cast({ backend, inputs: { x },\nattrs: { dtype: 'float32' });\n      inputId =\nbackend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(x.shape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n\n    if (input.dtype\n!== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n    return out;\n  }\n\n  export const preluConfig:\nKernelConfig = {\n  kernelName: Prelu,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: prelu as\n} as\nKernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\nApache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\nLicense.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\non an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\nimplied.\n * See the License for the specific language governing permissions and\n * limitations under the\nLicense.\n */
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=====\n*\n\nimport { KernelConfig, Pow } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\ncreateBinaryKernelConfig(Pow, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All\nRights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\nfile except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\nsoftware\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\nOR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\ngoverning permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n{ permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmProd: (\n  xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\n\nfunction setup(backend:\nBackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /* void */, [\n  'number',\n  'number',\n  'number',\n  'number'\n  ]);\n\n  function prod(args: {\n  backend: BackendWasm,\n  inputs: ProdInputs,\n  attrs:\nProdAttrs\n}): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x\n} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const\n{ transposed, axes, originalAxes, inputWasTransposed } =\npermuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n      const transposedId =\nbackend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We\nwill need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length, input.shape.length);\n    }\n\n    backend_util.assertAxesAreInnerMostDims(\n      'prod', reductionAxes, input.shape.length);\n    const [outShape,\nreduceShape] =\nbackend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize\n= util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, input.dtype);\n    if
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(util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n  // dispose of\n  the transposed tensor.\n  backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n  // reshape\n  const\n  newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n  kernelName: Prod,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: prod as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n  use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

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```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,\n  util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from\n  './Cast';\n\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters:\n  number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear =\n  backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', //\n  oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', //\n  newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n\n  function\n  resizeBilinear(args: {\n    backend: BackendWasm,\n    inputs: ResizeBilinearInputs,\n    attrs: ResizeBilinearAttrs\n  }):\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n\n    const {images} = inputs;\n    const {alignCorners,\n      halfPixelCenters, size} = attrs;\n    const [newHeight, newWidth] = size;\n\n    const [batch, oldHeight, oldWidth,\n      numChannels] = images.shape;\n    const outShape = [batch, newHeight, newWidth, numChannels];\n\n    let xData =\n      backend.dataIdMap.get(images.dataId);\n    let castedData;\n    if (xData.dtype !== 'float32') {\n      castedData =\n      cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n      xData =\n      backend.dataIdMap.get(castedData.dataId);\n    }\n\n    const xId = xData.id;\n\n    const out =\n      backend.makeOutput(outShape, 'float32');\n    if (util.sizeFromShape(images.shape) === 0) {\n      return out;\n    }\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmResizeBilinear(\n      xId, batch, oldHeight,\n      oldWidth, numChannels, newHeight, newWidth,\n      alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n    if\n  (castedData != null) {\n      backend.disposeData(castedData.dataId);\n    }\n\n    return out;\n  }\n\n  export const\n  resizeBilinearConfig: KernelConfig = {\n    kernelName: ResizeBilinear,\n    backendName: 'wasm',\n    setupFunc:\n  setup,\n    kernelFunc: resizeBilinear as { } as KernelFunc\n  };\n"/**\n * @license\n * Copyright 2020 Google LLC.\n  All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

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```

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=====\n\n*\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\nimport\n  {BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const\n  range =\n  (\n    args: {\n      backend: BackendWasm, attrs: RangeAttrs\n    }): TensorInfo => {\n    const {backend, attrs} =\n  args;\n    const {start, stop, step, dtype} = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n\n    const out = backend.makeOutput([values.length], dtype);\n    const outVals =\n  backend.toArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\n  export const rangeConfig:\n  KernelConfig = {\n    kernelName: Range,\n    backendName: 'wasm',\n    kernelFunc: range as { } as
```



```

N0aW9uIHJhbmdlSW1wbChcbiAgICBzdGFydDogbnVtYmVyLCBzdG9wOiBudW1iZXIsIHN0ZXA6IG51bWJlci
xcbiAgICBkdHlwZTogJ2Zsb2F0MzInfCdpbnQzMicpOiBEYXRhVHlwZU1hcFsnZmxvYXQzMicgfcAnaW50Mz
InXSB7XG4gIGNvbnN0IHNhbWVtdGFydFN0b3AgPSBzdGFydCA9PT0gc3RvcDtcbiAgY29uc3QgaW5jcmVhc
2luZ1JhbmdlTmVnYXRpdmVtdGVwID0gc3RhcncQgPCBzdG9wICYmIHN0ZXAgaPCAwO1xuICBjb25zdCBkZ
WNyZWZfaW5nUmFuZ2VQb3NpdGI2ZVN0ZXAgaPSBzdG9wIDwgc3RhcncQgJiYgc3RlcCA+IDE7XG5cbiAga
WYgKHNhbWVtdGFydFN0b3AgfHwgaW5jcmVhc2luZ1JhbmdlTmVnYXRpdmVtdGVwIHx8XG4gICAgICBk
ZWNyZWZfaW5nUmFuZ2VQb3NpdGI2ZVN0ZXAgaIHtcbiAgICBzYXR1cm4gdXRpbC5tYWtlWmVyb3NUeXB
lZEFycmF5KDAsIGR0eXBkTtcbiAgfVxuXG4gIGNvbnN0IG51bUVsZW1lbnRzID0gTWF0aC5hYnMoTWF0aC
5jZWlKChzdG9wIC0gc3RhcncQpIC8gc3RlcCkpO1xuICBjb25zdCB2YWx1ZXMgPSB1dGlsLm1ha2VaZXJvc1R
5cGVkQXJyYXkobnVtRWxlbWVudHM5IGR0eXBkTtcblxuICBpZiAoc3RvcCA8IHN0YXJ0ICYmIHN0ZXAgaP
T09IDEpIHtcbiAgICAvLyBBdXRvIGFkanVzdCB0aGUgc3RlcCdzIHNpZ24gaWYgaXQgaGFzbid0IGJlZW4gc2V
0XG4gICAgLy8gKG9yIHdhcyBzZXQgdG8gMSlcbiAgICBzdGVwID0gLTE7XG4gIH1cblxuICB2YWx1ZXNBM
F0gPSBzdGFydDtcbiAgZm9yIChsZXQgaSA9IDE7IGkgPCB2YWx1ZXMubGVuZ3RoOyBpKyspIHtcbiAgICB2
YWx1ZXNbaV0gPSB2YWx1ZXNbaSAtdFdcSgc3RlcDtcbiAgfVxuICBzYXR1cm4gdmdFsdWVzO1xufVxuIl19"
, "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,
Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may
obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by
applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\ncreateBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/*\n * @license\n
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {identity} from
'./Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array,
axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n
'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number'
// out_id\n  ]);\n}\n\nexport function reverse(\n  args: {inputs: ReverseInputs, backend: BackendWasm, attrs:
ReverseAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dims} =
attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return
identity({inputs: {x}, backend});\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const axesBytes =
new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
outId);\n\n    const reshaped =\n      reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\nexport const reverseConfig: KernelConfig = {\n
kernelName: Reverse,\n  backendName: 'wasm',\n  kernelFunc: reverse as {} as KernelFunc,\n  setupFunc:
setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight:
number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n
fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n  'number', // xId\n  'number', //
batch\n  'number', // imageHeight\n  'number', // imageWidth\n  'number', // numChannels\n  'number', //
radians\n  'number', // centerX\n  'number', // centerY\n  'array', // fillBytes\n  'number', // fillLength\n
'number', // outId\n ]);\n}\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,\n
backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n\n  const out =
backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n  const [centerX, centerY] =\n    backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n  const fillIsBlack = fillValue === 0;\n  const fullOpacityValue = 255;\n\n  const fillValues =
typeof fillValue === 'number' ?\n    [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n
[...fillValue, fullOpacityValue];\n  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n  imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n  centerY,
fillBytes, fillValues.length, outId);\n  return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n  backendName: 'wasm',\n  kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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```


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```
=====
*\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from
 './types';\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
  number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)
=> void;\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,
  null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', //
  sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n}\nfunction scatterNd(\n  args: \n    {backend: BackendWasm, inputs:
  ScatterNdInputs, attrs: ScatterNdAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices,
  updates} = inputs;\n    const {shape} = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if
  (util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const {sliceRank, numUpdates, sliceSize, strides,
  outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n\n    const indicesData =
  backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    const updatesData =
  backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n\n    const stridesBytes = new
  Uint8Array(new Int32Array(strides).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n      sliceSize,
  stridesBytes, outputSize, outId);\n\n    return out;\n  }\n}\nexport const scatterNdConfig: KernelConfig = {\n
  kernelName: ScatterNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: scatterNd as {} as
  KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the
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  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
  implied.\n * See the License for the specific language governing permissions and\n * limitations under the
  License.\n *
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*\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
 './unary_kernel';\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *
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  language governing permissions and\n * limitations under the License.\n *
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*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
 './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *
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  2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
  language governing permissions and\n * limitations under the License.\n *
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=====
*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,
offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n  'number', // conditionId\n  'number', // tId\n  'number', // eId\n
'number', // offset\n  'number', // outId\n  ]);\n\nfunction select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n  const {inputs, backend} = args;\n  const {condition, t, e} = inputs;\n\n  const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n  const tId = backend.dataIdMap.get(t.dataId).id;\n  const eId =
backend.dataIdMap.get(e.dataId).id;\n  const out = backend.makeOutput(t.shape, t.dtype);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const cRank = condition.shape.length;\n  const tRank =
t.shape.length;\n\n  const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n    1 : \n
util.sizeFromShape(t.shape.slice(1));\n\n  wasmSelect(conditionId, tId, eId, offset, outId);\n  return out;\n}\n\nexport
const selectConfig: KernelConfig = {\n  kernelName: Select,\n  backendName: 'wasm',\n  kernelFunc: select as { }
as KernelFunc,\n  setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
void */, ['number', 'number']);\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}): \n
TensorInfo {\n  const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out
= backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  // Short-
circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId,
outId);\n  return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n  kernelName: 'Sigmoid',\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sigmoid as { } as KernelFunc\n};\n", "/*\n * @license\n
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n  'number', // xId\n  'number', // outId\n
'number', // channels\n  'number' // batch\n  ]);\n\nfunction softmax(\n  args: {backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs}): \n  TensorInfo {\n  const {backend, inputs: {logits}, attrs: {dim}} =
args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape,
logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channels = logits.shape[dim];\n
const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if
(util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId, channels, batch);\n  return
out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n

```

setupFunc: setup,\n kernelFunc: softmax as { } as KernelFunc\n);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { padV2Config } from './PadV2';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\nfunction spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs: SpaceToBatchNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockSize, paddings } = attrs;\n  const prod = util.sizeFromShape(blockShape);\n  const completePaddings: Array<[number, number]> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<[number, number]>));\n  for (let i = 1 + blockSize.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n  const paddedX = padV2Config.kernelFunc({\n    inputs: { x },\n    backend,\n    attrs: { paddings: completePaddings, constantValue: 0 }\n  }) as TensorInfo;\n  const reshapedPaddedShape =\n    backend_util.getReshaped(paddedX.shape, blockSize, prod, false);\n  const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n    reshapedPaddedShape.length, blockSize.length, false);\n  const flattenShape =\n    backend_util.getReshapedPermuted(paddedX.shape, blockSize, prod, false);\n  const reshapeInputs: ReshapeInputs = { x: paddedX };\n  const reshapeAttrs: ReshapeAttrs = { shape: reshapedPaddedShape };\n  const paddedXReshaped =\n    reshape({ inputs: reshapeInputs, backend, attrs: reshapeAttrs });\n  const transposeInputs: TransposeInputs = { x: paddedXReshaped };\n  const transposeAttrs: TransposeAttrs = { perm: permutedReshapedPaddedPermutation };\n  const paddedXT =\n    transpose({ inputs: transposeInputs, backend, attrs: transposeAttrs });\n  const resultReshapeInputs: ReshapeInputs = { x: paddedXT };\n  const resultReshapeAttrs: ReshapeAttrs = { shape: flattenShape };\n  const result = reshape(\n    { inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs });\n  backend.disposeData(paddedX.dataId);\n  backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n  return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as { } as KernelFunc\n);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```

*\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\nimport {slice} from './Slice';\n\nexport function splitV(\n  args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n  const
{numOrSizeSplits, axis} = attrs;\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n  const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n
const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] =
s;\n    const xSlice =\n      slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n    begin[$axis] += s;\n
return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName:
'wasm',\n  kernelFunc: splitV as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n    'number', // x_id\n
'number', // alpha\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\n\nfunction step(\n  args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {alpha} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =
backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmStep(xId,
alpha, CCppType[x.dtype], outId);\n  return out;\n}\n\nexport const stepConfig: KernelConfig = {\n  kernelName:
Step,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: step as { } as KernelFunc\n};\n", "/*\n *
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copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n", "/*\n * @license\n
 * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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```
=====\n*\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array, xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n    'number', // xId\n    'array', // xStrides\n    'number', // xRank\n    'array', // beginBytes\n    'array', // endBytes\n    'array', // stridesBytes\n    'array', // outShapeBytes\n    'array', // outStridesBytes\n    'number', // outShapeLength\n    'number', // outId\n  ]);\n\n  export function stridedSlice(args: {\n    backend: BackendWasm,\n    inputs: StridedSliceInputs,\n    attrs: StridedSliceAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {x} = inputs;\n    const {\n      begin,\n      end,\n      strides,\n      beginMask,\n      endMask,\n      ellipsisMask,\n      newAxisMask,\n      shrinkAxisMask\n    } = attrs;\n    const {\n      finalShapeSparse,\n      finalShape,\n      isIdentity,\n      sliceDim0,\n      isSimpleSlice,\n      begin: $begin,\n      end: $end,\n      strides: $strides\n    } =\n      slice_util.sliceInfo(\n        x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n        newAxisMask, shrinkAxisMask);\n    let result;\n    if (isIdentity) {\n      // Optimization #1, slice is a no-op plus reshape\n      result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n    } else if (sliceDim0 || isSimpleSlice) {\n      // Optimization #2, slice is memory contiguous (only occurs in dim 0)\n      util.assert(\n        x.shape.length >= 1,\n        () => `Input must have rank at least 1, got: ${x.shape.length}`);\n      const size = slice_util.computeOutShape($begin, $end, $strides);\n      // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n      const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n      result =\n        reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n      backend.disposeData(sliced.dataId);\n    } else {\n      const out =\n        backend.makeOutput(finalShapeSparse, 'float32');\n      const xId = backend.dataIdMap.get(x.dataId).id;\n      const xStridesBytes =\n        new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n      const beginBytes =\n        new Uint8Array(new Int32Array($begin).buffer);\n      const endBytes =\n        new Uint8Array(new Int32Array($end).buffer);\n      const stridesBytes =\n        new Uint8Array(new Int32Array($strides).buffer);\n      const outputShapeBytes =\n        new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n      const outStridesBytes =\n        new Uint8Array(\n          new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n      const outId =\n        backend.dataIdMap.get(out.dataId).id;\n      wasmStridedSlice(\n        xId, xStridesBytes, x.shape.length, beginBytes, endBytes, stridesBytes,\n        outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n      result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n      backend.disposeData(out.dataId);\n    }\n\n    return result;\n  }\n\n  export const stridedSliceConfig: KernelConfig = {\n    kernelName: StridedSlice,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: stridedSlice as {} as KernelFunc\n  };\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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```
=====  
*\nimport { backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport  
{ permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmSum: (xId:  
number, reduceSize: number, dtype: number, outId: number) => void;\n\nfunction setup(backend:  
BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n    'number', // reduce_size\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\n\nfunction sum(args: { backend:  
BackendWasm, inputs: SumInputs, attrs: SumAttrs }): TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let  
inputId = xId;\n  let input = x;\n  const { transposed, axes, originalAxes, inputWasTransposed } =\n  permuteAxesAndTranspose(x, axis, backend);\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n    const  
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was  
not a no-op. We will need to dispose of this // once we are done.\n      input = transposed;\n      inputId =  
transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length,  
input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n    'sum', reductionAxes,  
input.shape.length);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =  
util.sizeFromShape(reduceShape);\n  const out = backend.makeOutput(outShape, input.dtype);\n  if  
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n  if (inputWasTransposed) {\n    // dispose of  
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n  if (keepDims) {\n    // reshape\n    const  
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n  return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google  
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not  
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\nimport { KernelConfig, Sub } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from  
'./binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n  createBinaryKernelConfig(Sub, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All  
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file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\nimport { KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs } from '@tensorflow/tfjs-core';\nimport  
{ BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\nlet wasmTile: (xId:  
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:
```

```

number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n  'number', // x_id\n  'array', // x_shape\n  'number', //
x_shape.length\n  'array', // new_shape\n  'number', // new_shape.length\n  'number' // out_id\n
]);\n}\n\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n  const out =
backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n  CppDType[out.dtype], outId);\n  return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n\n", /**\n * @license\n * Copyright 2021 Google LLC. All Rights
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except in compliance with the License.\n * You may obtain a copy of the License at\n *
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n\n", /**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n\n", /**\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number',
// x.shape.length\n  'number', // x.dtype\n  'number', // k\n  'bool', // sorted\n  'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n}\n\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n
const {k, sorted} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n

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```

const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n
backend.makeOutput(outputShape, 'int32');\n
backend.dataIdMap.get(outIndices.dataId).id;\n\n
wasmTopK(\n      xId, xShapeBytes, x.shape.length,\n      CppDType[x.dtype], k, sorted,\n      outValuesId, outIndicesId);\n\n
return [outValues, outIndices];\n
};\n\n
export const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: topk as { } as KernelFunc,\n};\n\n
"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n
=====\n
*/\n\n
import {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from '@tensorflow/tfjs-core';\n
import {BackendWasm} from '../backend_wasm';\n\n
let wasmTransform: (\n  imageId: number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth: number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n  stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number) => void;\n\n
function setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n    'number', // imageId\n    'number', // transformsId\n    'bool', // isBatchTransform\n    'number', // batch\n    'number', // outHeight\n    'number', // outWidth\n    'number', // numChannels\n    'number', // imageWidth\n    'number', // imageHeight\n    'array', // strides\n    'number', // stridesLength\n    'number', // interpolationModeId\n    'number', // fillModeId\n    'number', // fillValue\n    'number' // outId\n  ]);\n\n
function transform(\n  args: \n    {backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {image, transforms} = inputs;\n    const {interpolation, fillMode, fillValue, outputShape} = attrs;\n    const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n    const [outHeight, outWidth] =\n      outputShape != null ? outputShape : [imageHeight, imageWidth];\n    const outShape =\n      [batch, outHeight, outWidth,\n        numChannels] as [number, number, number, number];\n    const strides =\n      new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n    const out = backend.makeOutput(outShape, image.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const imageData = backend.dataIdMap.get(image.dataId);\n    const imageId = imageData.id;\n\n    const transformsData = backend.dataIdMap.get(transforms.dataId);\n    const transformsId = transformsData.id;\n\n    const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n    let fillModeId;\n    switch (fillMode) {\n      case 'constant':\n        fillModeId = 1;\n        break;\n      case 'reflect':\n        fillModeId = 2;\n        break;\n      case 'wrap':\n        fillModeId = 3;\n        break;\n      case 'nearest':\n        fillModeId = 4;\n        break;\n      default:\n        fillModeId = 1;\n        break;\n    }\n\n    wasmTransform(\n      imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n      outWidth, numChannels, imageWidth, imageHeight, strides,\n      image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n      outId);\n\n    return out;\n  }\n\n
export const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as { } as KernelFunc\n};\n\n
"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n
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*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { slice } from
'./Slice';\n\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n  const { inputs, backend, attrs } = args;\n  const { value } = inputs;\n  let { axis } = attrs;\n  if (axis <
0) {\n  axis += value.shape.length;\n  }\n\n  const numOutputs = value.shape[axis];\n  const rank =
value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;\n  i++) {\n  if (i !== axis) {\n  outShape[outIndex++] = value.shape[i];\n  }\n  }\n  const outs: TensorInfo[] = new
Array(numOutputs);\n  const begin = new Array(rank).fill(0);\n  const size = value.shape.slice();\n  size[axis] = 1;\n  for (let i = 0; i < outs.length; i++) {\n  begin[axis] = i;\n  outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },
backend});\n  }\n  return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n  }\n\nexport const
unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as { } as
KernelFunc,\n  };\n  "/*\n  * @license\n  * Copyright 2020 Google LLC. All Rights Reserved.\n  * Licensed under the
Apache License, Version 2.0 (the "License");\n  * you may not use this file except in compliance with the
License.\n  * You may obtain a copy of the License at\n  * http://www.apache.org/licenses/LICENSE-2.0\n  *\n  *
Unless required by applicable law or agreed to in writing, software\n  * distributed under the License is distributed
on an "AS IS" BASIS,\n  * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n  * See the License for the specific language governing permissions and\n  * limitations under the
License.\n  *

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We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the
library. A modular build would replace\n// the contents of this file and import only the kernels that are
needed.\n\nimport { KernelConfig, registerKernel } from '@tensorflow/tfjs-core';\n\nimport { fusedMatMulConfig }
from './kernels/_FusedMatMul';\n\nimport { absConfig } from './kernels/Abs';\n\nimport { addConfig } from
'./kernels/Add';\n\nimport { addNConfig } from './kernels/AddN';\n\nimport { allConfig } from './kernels/All';\n\nimport
{ anyConfig } from './kernels/Any';\n\nimport { argMaxConfig } from './kernels/ArgMax';\n\nimport { avgPoolConfig }
from './kernels/AvgPool';\n\nimport { batchMatMulConfig } from './kernels/BatchMatMul';\n\nimport
{ batchToSpaceNDConfig } from './kernels/BatchToSpaceND';\n\nimport { castConfig } from './kernels/Cast';\n\nimport
{ ceilConfig } from './kernels/Ceil';\n\nimport { clipByValueConfig } from './kernels/ClipByValue';\n\nimport
{ concatConfig } from './kernels/Concat';\n\nimport { conv2DConfig } from './kernels/Conv2D';\n\nimport
{ conv2DBackpropInputConfig } from './kernels/Conv2DBackpropInput';\n\nimport { cosConfig } from
'./kernels/Cos';\n\nimport { coshConfig } from './kernels/Cosh';\n\nimport { cropAndResizeConfig } from
'./kernels/CropAndResize';\n\nimport { cumsumConfig } from './kernels/Cumsum';\n\nimport { depthToSpaceConfig }
from './kernels/DepthToSpace';\n\nimport { depthwiseConv2dNativeConfig } from
'./kernels/DepthwiseConv2dNative';\n\nimport { eluConfig } from './kernels/Elu';\n\nimport { equalConfig } from
'./kernels/Equal';\n\nimport { expConfig } from './kernels/Exp';\n\nimport { expandDimsConfig } from
'./kernels/ExpandDims';\n\nimport { fillConfig } from './kernels/Fill';\n\nimport { flipLeftRightConfig } from
'./kernels/FlipLeftRight';\n\nimport { floorConfig } from './kernels/Floor';\n\nimport { floorDivConfig } from
'./kernels/FloorDiv';\n\nimport { fusedBatchNormConfig } from './kernels/FusedBatchNorm';\n\nimport
{ fusedConv2DConfig } from './kernels/FusedConv2D';\n\nimport { fusedDepthwiseConv2DConfig } from
'./kernels/FusedDepthwiseConv2D';\n\nimport { gatherNdConfig } from './kernels/GatherNd';\n\nimport
{ gatherV2Config } from './kernels/GatherV2';\n\nimport { greaterConfig } from './kernels/Greater';\n\nimport
{ greaterEqualConfig } from './kernels/GreaterEqual';\n\nimport { identityConfig } from './kernels/Identity';\n\nimport
{ leakyReluConfig } from './kernels/LeakyRelu';\n\nimport { lessConfig } from './kernels/Less';\n\nimport
{ lessEqualConfig } from './kernels/LessEqual';\n\nimport { logConfig } from './kernels/Log';\n\nimport
{ logicalAndConfig } from './kernels/LogicalAnd';\n\nimport { maxConfig } from './kernels/Max';\n\nimport
{ maximumConfig } from './kernels/Maximum';\n\nimport { maxPoolConfig } from './kernels/MaxPool';\n\nimport
{ meanConfig } from './kernels/Mean';\n\nimport { minConfig } from './kernels/Min';\n\nimport { minimumConfig } from
'./kernels/Minimum';\n\nimport { mirrorPadConfig } from './kernels/MirrorPad';\n\nimport { multiplyConfig } from

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./kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
./kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
./kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
./kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
./kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
./kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
./kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n
  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n
  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n
  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n
  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n
  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n
  zerosLikeConfig];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n\n"/**\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const
zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n  // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n  // code. In this case it is a small program that
contains SIMD\n  // instructions.\n  'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n    0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n    2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n  ])));\n\n/**\n * True if threads are supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n  //
TODO(annxingyuan): Enable node support once this is resolved:\n  //
https://github.com/tensorflow/tfjs/issues/3830\n  if (ENV.get('IS_NODE')) {\n    return false;\n  }\n\n  try {\n  //
Test for transferability of SABs (needed for Firefox)\n  //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n  new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n  // This typed array is a WebAssembly
program containing threaded\n  // instructions.\n  return WebAssembly.validate(new Uint8Array([\n    0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n    4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n  ]));\n  } catch (e) {\n    return false;\n  }\n});\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n  if (typeof __filename !== 'undefined') _scriptDir = __scriptDir || __filename;\n  return
(\nfunction(WasmBackendModuleThreadedSimd) {\n  WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd: {};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram="./this.program";var quit_=function(status,toThrow){throw toThrow};var

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ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\\\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\\\"path\\\").
dirname(scriptDirectory)+\\\"^\"}else{scriptDirectory=__dirname+\\\"^\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\\\"fs\\\");if(!nodePath)nodePath=require(\\\"path\\\");filename=n
odePath[\\\"normalize\\\"](filename);return
nodeFS[\\\"readFileSync\\\"](filename,binary?null:\\\"utf8\\\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\\\"argv\\\"].length>1){thisProgram=process[\\\"argv\\\"][[1].replace(/\\\\\\\\g,\\\"^\\\")}arguments_=process[\\\"arg
v\\\"].slice(2);process[\\\"on\\\"](\\\"uncaughtException\\\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\\\"on\\\"](\\\"unhandledRejection\\\",abort);quit_=function(status){process[\\\"exit\\\"](status)};Module[\\\"insp
ect\\\"]=function(){return\\\"[Emscripten Module object]\\\"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\\\"worker_threads\\\")}catch(e){console.error(\\\"The
\\\"worker_threads\\\" module is not supported in this node.js build - perhaps a newer version is needed?\\\");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\\\"){read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\\\"){return new
Uint8Array(readbuffer(f))}data=read(f,\\\"binary\\\");assert(typeof data===\"object\\\");return data};if(typeof
scriptArgs!=\"undefined\\\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\\\"){arguments_=arguments}if(typeof
quit===\"function\\\"){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\\\"){if(typeof
console===\"undefined\\\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\\\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\\\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=\"undefined\\\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\\\"blob:\\\")!=\"0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\\\"^\\\")+1)}else{scriptDirectory=\\\"}\\\"}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\\\"fs\\\");if(!nodePath)nodePath=require(\\\"path\\\");filename=n
odePath[\\\"normalize\\\"](filename);return
nodeFS[\\\"readFileSync\\\"](filename,binary?null:\\\"utf8\\\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\\\"GET\\\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\\\"GET\\\",url,false);xhr.responseType=\\\"arraybuffer\\\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\\\"GET\\\",url,true);xhr.responseType=\\\"arraybuffer\\\";xhr.onload=function(){if(xhr.status

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==200||xhr.status===0&&xhr.response){onload(xhr.response);return }onerror();xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance===\undefined\){global.performance=require(\perf_hooks\).performance}}var
out=Module[\print\]|console.log.bind(console);var err=Module[\printErr\]|console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\arguments\])arguments_=Module[\arguments\];if(Module[\thisProgram\])thisProgram=
Module[\thisProgram\];if(Module[\quit\])quit_=Module[\quit\];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\wasmBinary\])wasmBinary=Module[\wasmBinary\];var
noExitRuntime=Module[\noExitRuntime\]|true;if(typeof WebAssembly!=="object"){abort(\no native wasm
support detected)}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\Assertion failed: \'+text)}}function getCFunc(ident){var
func=Module[\_\' +ident];assert(func,\Cannot call unknown function \'+ident+, make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC=\\string\':function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\array\':function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\string\')return UTF8ToString(ret);if(returnType===\boolean\')return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\number\'});var
numericRet=returnType!=="string\';if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var

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len=0;for(var i=0;i<str.length;++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmmem
ory=Module["wasmMemory"];buffer=Module["buffer"]}else if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]((ru
nDependencies))}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]((runDependencies))}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new

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Error).stack);what+="\":err(what);ABORT=true;EXITSTATUS=1;what="\abort(\"+what+\"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="\data:application/octet-stream;base64,\";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="\file:/\";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="\tfjs-backend-wasm-threaded-
simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the
wasm failed\"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\\"same-
origin\").then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
\"+wasmBinaryFile+\"\"}return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)}})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\\"wasm-
instantiate\").}))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\\"wasm-instantiate\");}function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\\"same-
origin\").then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\\"wasm streaming compile failed: \"+reason);err(\\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA

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TCH:110,ENOCESI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function
_emsripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return
-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),_emsripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),_emsripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw`Atomics.notify returned an unexpected value
`+ret}Module["_emsripten_futex_wake"]=_emsripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw`Internal Error! killThread() can only ever be
called from main application thread!`;if(!pthread_ptr)throw`Internal Error! Null pthread_ptr in
killThread!`;GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw`Internal Error! cancelThread() can only
ever be called from main application thread!`;if(!pthread_ptr)throw`Internal Error! Null pthread_ptr in
cancelThread!`;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({cmd:"cancel"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw`Internal Error! cleanupThread() can only
ever be called from main application thread!`;if(!pthread_ptr)throw`Internal Error! Null pthread_ptr in
cleanupThread!`;var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);_emsripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emsripten_register_main_browser_thread_id(tb);initWorker:function(){},pthreads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor

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e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emsc
ripten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\":"exit"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\":"cancelDone"})},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"])}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\" to target pthread '+d["targetThread"]+'\", but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){__emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d["thread"])}else
if(cmd===\"killThread\"){killThread(d["thread"])}else
if(cmd===\"cancelThread\"){cancelThread(d["thread"])}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d["threadId"]+\"\":
\"+d["text"])}else if(cmd===\"printErr\"){err(\"Thread \"+d["threadId"]+\"\": \"+d["text"])}else
if(cmd===\"alert\"){alert(\"Thread \"+d["threadId"]+\"\": \"+d["text"])}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\"exitProcess\"){try{exit(d["returnCode"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent
an error! \"+e.filename+\":\"+e.lineno+\":
\"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:d
ata})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post

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Message({"cmd":"load","urlOrBlob":Module["mainScriptUrlOrBlob"]||_scriptDir,"wasmMemory":wasmMemory,"wasmModule":wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile("tfjs-backend-wasm-threaded-simd.worker.js");PThread.unusedWorkers.push(new Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var t=performance.now()+msecs;while(performance.now()<t){}};function establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop)}Module["establishStackSpace"]=establishStackSpace;function getNoExitRuntime(){return noExitRuntime}Module["getNoExitRuntime"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return wasmTable.get(ptr)(arg)}Module["invokeEntryPoint"]=invokeEntryPoint;function __assert_fail(condition,filename,line,func){abort("Assertion failed: "+UTF8ToString(condition)+" , at: "+[filename?UTF8ToString(filename):"unknown filename",line,func?UTF8ToString(func):"unknown function"])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var _emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var t=process["hrtime"]();return t[0]*1e3+t[1]/1e6}}else if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-Module["__performance_now_clock_drift"]}}else if(typeof dateNow!="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(1,1,func,arg)}function __emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessage({"cmd":"processQueuedMainThreadWork"})}else if(ENVIRONMENT_IS_PTHREAD){postMessage({"targetThread":targetThreadId,"cmd":"processThreadQueue"})}else{var pthread=PThread.threads[targetThreadId];var worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({"cmd":"processThreadQueue"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret=="timed-out")return-73;if(ret=="not-equal")return-6;if(ret=="ok")return 0;throw"Atomics.wait returned an unexpected value "+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return 0}}function _emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function _emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("os").cpus().length;return navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var

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args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){ var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);return
ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){ var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){ var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){ var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){ var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){ var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){ var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef

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_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emsripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emsripten_set_current_thread_status(newStatus){}function
_emsripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension("\'ANGLE_instanced_arrays\");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ext["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcount){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension("\'OES_vertex_array_object\");if(ext){ctx["createVertexArray"]=function(){return
ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension("\'WEBGL_draw_buffers\");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffers
WEBGL"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension("\'WEBGL_multi_dra
w\'))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source="";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("\'webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===undefined||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contex
tHandle])GL.currentContext=null;if(typeof
JSEvents===object)JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\'

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EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("\lose_context")<0&&ext.inde
xOf("\debug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)!="\"){name=name.slice(0,name.lastIndexOf("\("))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\["+j+"]";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["default","\low-power","\high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iow,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iow,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iow+i*8>>2];var len=GROWABLE_HEAP_I32()[iow+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var

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pthread=PThread.pthreads[threadParams.pthread_ptr]={ worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={`cmd\":"run\","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\undefined){err(\Current
environment does not support SharedArrayBuffer, pthreads are not available!")}return
6}if(!pthread_ptr){err(\pthread_create called with a null thread pointer!")}return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw\Canceled!}function
_emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread");}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err(\pthread_join attempted on a null thread
pointer!")}return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()===thread){err(\PThread
\'+thread+\ is attempting to join to itself!")}return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()===thread){err(\Main thread
\'+thread+\ is attempting to join to itself!")}return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\pthread_join attempted on thread
\'+thread+\ , which does not point to a valid thread, or does not exist anymore!")}return
ERRNO_CODES.ESRCH}var

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detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("Attempted to join thread
\"+thread+\", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thre
ad_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_w
rite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscript
en_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"

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asm\"][\["G\").apply(null,arguments)};var
_dispose=Module[\["_dispose\"]=function(){return(_dispose=Module[\["_dispose\"]=Module[\["asm\"][\["H\").apply(
null,arguments)}];var
_Abs=Module[\["_Abs\"]=function(){return(_Abs=Module[\["_Abs\"]=Module[\["asm\"][\["J\").apply(null,arguments
)}];var
_Add=Module[\["_Add\"]=function(){return(_Add=Module[\["_Add\"]=Module[\["asm\"][\["K\").apply(null,argumen
ts)}];var
_AddN=Module[\["_AddN\"]=function(){return(_AddN=Module[\["_AddN\"]=Module[\["asm\"][\["L\").apply(null,arg
uments)}];var
_All=Module[\["_All\"]=function(){return(_All=Module[\["_All\"]=Module[\["asm\"][\["M\").apply(null,arguments)}];
var
_Any=Module[\["_Any\"]=function(){return(_Any=Module[\["_Any\"]=Module[\["asm\"][\["N\").apply(null,argumen
ts)}];var
_ArgMax=Module[\["_ArgMax\"]=function(){return(_ArgMax=Module[\["_ArgMax\"]=Module[\["asm\"][\["O\").ap
ply(null,arguments)}];var
_AvgPool=Module[\["_AvgPool\"]=function(){return(_AvgPool=Module[\["_AvgPool\"]=Module[\["asm\"][\["P\").a
pply(null,arguments)}];var
_BatchMatMul=Module[\["_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\["_BatchMatMul\"]=Modu
le[\["asm\"][\["Q\").apply(null,arguments)}];var
_Ceil=Module[\["_Ceil\"]=function(){return(_Ceil=Module[\["_Ceil\"]=Module[\["asm\"][\["R\").apply(null,argument
s)}];var
_ClipByValue=Module[\["_ClipByValue\"]=function(){return(_ClipByValue=Module[\["_ClipByValue\"]=Module[\
["asm\"][\["S\").apply(null,arguments)}];var
_Conv2D=Module[\["_Conv2D\"]=function(){return(_Conv2D=Module[\["_Conv2D\"]=Module[\["asm\"][\["T\").app
ly(null,arguments)}];var
_Conv2DBackpropInput=Module[\["_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\["_Conv2DBackpropInput\"]=Module[\["asm\"][\["U\").apply(null,arguments)}];var
_Cos=Module[\["_Cos\"]=function(){return(_Cos=Module[\["_Cos\"]=Module[\["asm\"][\["V\").apply(null,arguments
)}];var
_Cosh=Module[\["_Cosh\"]=function(){return(_Cosh=Module[\["_Cosh\"]=Module[\["asm\"][\["W\").apply(null,argu
ments)}];var
_CropAndResize=Module[\["_CropAndResize\"]=function(){return(_CropAndResize=Module[\["_CropAndResize\"]=
Module[\["asm\"][\["X\").apply(null,arguments)}];var
_Cumsum=Module[\["_Cumsum\"]=function(){return(_Cumsum=Module[\["_Cumsum\"]=Module[\["asm\"][\["Y\").a
pply(null,arguments)}];var
_DepthToSpace=Module[\["_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\["_DepthToSpace\"]=M
odule[\["asm\"][\["Z\").apply(null,arguments)}];var
_DepthwiseConv2dNative=Module[\["_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=M
odule[\["_DepthwiseConv2dNative\"]=Module[\["asm\"][\["_\").apply(null,arguments)}];var
_Elu=Module[\["_Elu\"]=function(){return(_Elu=Module[\["_Elu\"]=Module[\["asm\"][\["$").apply(null,arguments)}]
};var
_Equal=Module[\["_Equal\"]=function(){return(_Equal=Module[\["_Equal\"]=Module[\["asm\"][\["aa\").apply(null,ar
guments)}];var
_Exp=Module[\["_Exp\"]=function(){return(_Exp=Module[\["_Exp\"]=Module[\["asm\"][\["ba\").apply(null,argument
s)}];var
_FlipLeftRight=Module[\["_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\["_FlipLeftRight\"]=Modul
e[\["asm\"][\["ca\").apply(null,arguments)}];var
_Floor=Module[\["_Floor\"]=function(){return(_Floor=Module[\["_Floor\"]=Module[\["asm\"][\["da\").apply(null,arg

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uments));var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][["ea"]]).
apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchN
orm"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Mod
ule["asm"][["ga"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=M
odule["_FusedDepthwiseConv2D"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][["ia"]]).apply(nul
l,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][["ja"
]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][["ka"]]).apply(
null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module[
"asm"][["la"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][
["ma"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][["na"]]).apply(null,argume
nts)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][["o
a"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][["pa"]]).apply(null,argument
s)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm
"][["qa"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][["ra"]]).apply(null,argume
nts)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["sa"]]).
apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["ta"
]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["ua"]]).apply(null,ar
guments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["va"]]).apply(null,argumen
ts)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["wa
"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["x
a"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ya"
]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["za"]]).apply(null,argumen
ts)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Mod
ule["_NonMaxSuppressionV3"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Mod

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ule["_NonMaxSuppressionV4"]=Module["_asm"]["_Ba"].apply(null,arguments);var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Mod
ule["_NonMaxSuppressionV5"]=Module["_asm"]["_Ca"]).apply(null,arguments);var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["_asm"]["_Da\
"]).apply(null,arguments);var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["_asm"]["_Ea"]).appl
y(null,arguments);var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["_asm"]["_Fa"]).apply(nu
ll,arguments);var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["_asm"]["_Ga"]).apply(null,argume
nts);var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["_asm"]["_Ha"]).apply(null,arg
uments);var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["_asm"]["_Ia"]).apply(null,argum
ents);var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["_asm"]["_Ja"]).app
ly(null,arguments);var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["_asm"]["_Ka"]).apply(null,argum
ents);var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["_asm"]["_La"]).apply(null,a
rguments);var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Mo
dule["_asm"]["_Ma"]).apply(null,arguments);var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["_asm"]["_Na"]).app
ly(null,arguments);var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["_asm"]["_Oa"]).apply(null,arguments);var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["_asm"]["_Pa"]).apply(nul
l,arguments);var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["_asm"]["_Qa"]).apply(null,arg
uments);var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["_asm"]["_Ra
"]).apply(null,arguments);var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["_asm"]["_Sa\
"]).apply(null,arguments);var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["_asm"]["_Ta"]).ap
ply(null,arguments);var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["_asm"]["_Ua"]).apply(null,arguments)
};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["_asm"]["_Va"]).a
pply(null,arguments);var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["_asm"]["_Wa"]).apply(null,argume
nts);var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["_asm"]["_Xa"]).apply(n
ull,arguments);var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["_asm"]["_Ya"]).apply(null,arguments);var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["_asm"]["_Za"]).apply(null,argume

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nts));var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"]["_a"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["$a"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["ab"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["bb"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["cb"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["db"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["eb"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["fb"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["gb"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"]["hb"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["ib"]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["jb"]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"]["kb"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["asm"]["lb"]).apply(null,arguments)};var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["asm"]["mb"]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"]["nb"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=function(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=Module["asm"]["ob"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=Module["asm"]["pb"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=function(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=Module["asm"]["qb"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"]["rb"]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=Module["asm"]["sb"]).apply(null,arguments)};var

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WasmBackendModuleThreadedSimd;\n", "\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{ };var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){ readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={ };var key;for(key in
Module){if(Module.hasOwnProperty(key)){ moduleOverrides[key]=Module[key] } }var arguments_=[];var
thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\\\\\g,\"/\");arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\"){if(typeof
console===\"undefined\")console={ };console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print } else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src;if(_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}}{read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return }onerror()};xhr.onerror=onerror;xhr.send(null)}

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}setWindowTitle=function(title){ document.title=title }else{ }var
out=Module[\'"print"\'||console.log.bind(console);var err=Module[\'"printErr"\'||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\'"arguments"\'])arguments_=Module[\'"arguments"\'];if(Module[\'"thisProgram"\'])thisProgram=
Module[\'"thisProgram"\'];if(Module[\'"quit"\'])quit_=Module[\'"quit"\''];var
wasmBinary;if(Module[\'"wasmBinary"\'])wasmBinary=Module[\'"wasmBinary"\''];var
noExitRuntime=Module[\'"noExitRuntime"\'||true;if(typeof WebAssembly!=="object"){abort(\'"no native wasm
support detected"\' )}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\'"Assertion failed: \' +text"\' )}function getCFunc(ident){ var
func=Module[\'"_' +ident];assert(func,\'"Cannot call unknown function \' +ident+"", make sure it is exported");return
func }function ccall(ident,returnType,argTypes,args,opts){ var toC={\'"string"\' :function(str){ var
ret=0;if(str!==null&&str!==undefined&&str!==0){ var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret },\'"array"\' :function(arr){ var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret }};function
convertReturnValue(ret){if(returnType===\'"string"\' )return UTF8ToString(ret);if(returnType===\'"boolean"\' )return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){ var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}} }var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){ argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\'"number"\' });var
numericRet=returnType!=="string" ;if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)} }var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder(\'"utf8"\' ):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){ var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{ var
str=\'"\' ;while(idx<endPtr){ var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue }var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue }var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{ var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)} }return str}function
UTF8ToString(ptr,maxBytesToRead){ return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\'"\' }function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){ if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){ var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){ return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function

```

```

updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort("+what+"\n). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file==wasmBinaryFile&&wasmBinaryFile){return new
Uint8Array(wasmBinaryFile)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+"wasmBinaryFile+"})return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function

```



```

receiveInstantiatedSource(output){receiveInstance(output["instance\"])function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err("\failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\function\&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\function\"){return fetch(wasmBinaryFile,{credentials:"same-
origin\").then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("\wasm streaming compile failed: \"+reason);err("\falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm\"){try{var
exports=Module["instantiateWasm\"](info,receiveInstance);return exports}catch(e){err("\Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\function\){callback(Module);continue}var func=callback.func;if(typeof
func===\number\){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg
)}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function
_emscipten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscipten_get_heap_size(){return HEAPU8.length}function
emscipten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscipten_resize_heap(requestedSize){var oldSize=_emscipten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscipten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var
i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _pthread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return

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16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84: {if(typeof
navigator===\object")return navigator[\hardwareConcurrency\]|1;return 1 } setErrNo(28);return-1 } var
asmLibraryArg={\a\:_abort,\d\:_emscripten_memcpy_big,\e\:_emscripten_resize_heap,\f\:_fd_close,\c\:_f
d_seek,\b\:_fd_write,\h\:_pthread_create,\g\:_pthread_join,\i\:_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\__wasm_call_ctors\]=function(){return(__wasm_call_ctors=Module[\__wasm
_call_ctors\]=Module[\asm\][\k\]).apply(null,arguments)};var
_init=Module[\_init\]=function(){return(_init=Module[\_init\]=Module[\asm\][\l\]).apply(null,arguments)};
var
_init_with_threads_count=Module[\_init_with_threads_count\]=function(){return(_init_with_threads_count=Mod
ule[\_init_with_threads_count\]=Module[\asm\][\m\]).apply(null,arguments)};var
_get_threads_count=Module[\_get_threads_count\]=function(){return(_get_threads_count=Module[\_get_threads
_count\]=Module[\asm\][\n\]).apply(null,arguments)};var
_register_tensor=Module[\_register_tensor\]=function(){return(_register_tensor=Module[\_register_tensor\]=M
odule[\asm\][\o\]).apply(null,arguments)};var
_dispose_data=Module[\_dispose_data\]=function(){return(_dispose_data=Module[\_dispose_data\]=Module[\
asm\][\p\]).apply(null,arguments)};var
_dispose=Module[\_dispose\]=function(){return(_dispose=Module[\_dispose\]=Module[\asm\][\q\]).apply(n
ull,arguments)};var
_Abs=Module[\_Abs\]=function(){return(_Abs=Module[\_Abs\]=Module[\asm\][\s\]).apply(null,arguments
)};var
_Add=Module[\_Add\]=function(){return(_Add=Module[\_Add\]=Module[\asm\][\t\]).apply(null,argument
s)};var
_AddN=Module[\_AddN\]=function(){return(_AddN=Module[\_AddN\]=Module[\asm\][\u\]).apply(null,ar
guments)};var
_All=Module[\_All\]=function(){return(_All=Module[\_All\]=Module[\asm\][\v\]).apply(null,arguments)};
var
_Any=Module[\_Any\]=function(){return(_Any=Module[\_Any\]=Module[\asm\][\w\]).apply(null,argumen
ts)};var
_ArgMax=Module[\_ArgMax\]=function(){return(_ArgMax=Module[\_ArgMax\]=Module[\asm\][\x\]).app
ly(null,arguments)};var
_AvgPool=Module[\_AvgPool\]=function(){return(_AvgPool=Module[\_AvgPool\]=Module[\asm\][\y\]).a
pply(null,arguments)};var
_BatchMatMul=Module[\_BatchMatMul\]=function(){return(_BatchMatMul=Module[\_BatchMatMul\]=Modu
le[\asm\][\z\]).apply(null,arguments)};var
_Ceil=Module[\_Ceil\]=function(){return(_Ceil=Module[\_Ceil\]=Module[\asm\][\A\]).apply(null,argument
s)};var
_ClipByValue=Module[\_ClipByValue\]=function(){return(_ClipByValue=Module[\_ClipByValue\]=Module[\
asm\][\B\]).apply(null,arguments)};var
_Conv2D=Module[\_Conv2D\]=function(){return(_Conv2D=Module[\_Conv2D\]=Module[\asm\][\C\]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module[\_Conv2DBackpropInput\]=function(){return(_Conv2DBackpropInput=Modul
e[\_Conv2DBackpropInput\]=Module[\asm\][\D\]).apply(null,arguments)};var
_Cos=Module[\_Cos\]=function(){return(_Cos=Module[\_Cos\]=Module[\asm\][\E\]).apply(null,arguments
)};var
_Cosh=Module[\_Cosh\]=function(){return(_Cosh=Module[\_Cosh\]=Module[\asm\][\F\]).apply(null,argu
ments)};var
_CropAndResize=Module[\_CropAndResize\]=function(){return(_CropAndResize=Module[\_CropAndResize\])

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=Module["asm"]["G"].apply(null,arguments));var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["H"]).a
pply(null,arguments));var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=M
odule["asm"]["I"]).apply(null,arguments));var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=M
odule["_DepthwiseConv2dNative"]=Module["asm"]["J"]).apply(null,arguments));var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"]).apply(null,arguments)
};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"]).apply(null,arg
uments));var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"]).apply(null,argument
s));var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Modu
le["asm"]["N"]).apply(null,arguments));var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"]).apply(null,argu
ments));var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"]).
apply(null,arguments));var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchN
orm"]=Module["asm"]["Q"]).apply(null,arguments));var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Modu
le["asm"]["R"]).apply(null,arguments));var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=M
odule["_FusedDepthwiseConv2D"]=Module["asm"]["S"]).apply(null,arguments));var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["T"]).apply(null
,arguments));var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["U"
]).apply(null,arguments));var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["V"]).apply(
null,arguments));var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module[
"asm"]["W"]).apply(null,arguments));var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["
X"]).apply(null,arguments));var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["Y"]).apply(null,argume
nts));var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["
Z"]).apply(null,arguments));var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["_"]).apply(null,arguments
)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm
"]["$"]).apply(null,arguments));var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["aa"]).apply(null,argume
nts));var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["ba"]).
apply(null,arguments));var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["c

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a").apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["da"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["ea"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]["fa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"]["ga"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"]["ha"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"]["ia"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"]["ja"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"]["ka"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"]["la"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"]["ma"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"]["na"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"]["oa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"]["pa"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"]["qa"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"]["ra"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"]["sa"]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"]["ta"]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"]["ua"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"]["va"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"]["wa"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"]["xa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"]["ya"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"]["za"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"]["Aa"]

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\").apply(null,arguments));var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"]["Ba"]).
.apply(null,arguments));var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"]["Ca"]).ap
ply(null,arguments));var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"]["Da"]).apply(null,arguments)
};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Ea"]).ap
ply(null,arguments));var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Fa"]).apply(null,argumen
ts));var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Ga"]).apply(n
ull,arguments));var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"]["Ha"]).apply(null,arguments));var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Ia"]).apply(null,argume
nts));var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"]["Ja"]).apply(null,arguments));var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["Ka"]).apply(null,argument
s));var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["La"]).apply(null,argumen
ts));var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["Ma"]).apply(null,argumen
ts));var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["Na"]).apply(null,argu
ments));var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["Oa"]).apply(null,argumen
ts));var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["Pa"]).apply(null,ar
guments));var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["Qa"
]).apply(null,arguments));var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["Ra"
]).apply(null,arguments));var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"]["Sa"]).apply(null,arguments));var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["Ta"]).apply(nu
ll,arguments));var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["Ua"]).apply(null,argument
s));var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"]["Va"]).apply(null,arguments));var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"]["Wa"
]).apply(null,arguments));var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
]["Xa"]).apply(null,arguments));var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"]["Ya"

```

```

).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+"");this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"]("")},1);doRun()},1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n};\n\n\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\nimport './flags_wasm';\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'./wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. *\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return
this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start =
util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n\n move(\n dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n }\n\n const size = util.sizeFromShape(shape);\n const numBytes = size *
util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n\n
this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values
as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n
memoryOffset);\n }\n }\n\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return

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this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n  const {memoryOffset,\n  dtype, shape, stringBytes} =\n    this.dataIdMap.get(dataId);\n  if (dtype === 'string') {\n    return stringBytes;\n  }\n  const bytes = this.wasm.HEAPU8.slice(\n    memoryOffset,\n    memoryOffset +\n    util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n  return typedArrayFromBuffer(bytes.buffer, dtype);\n}\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n disposeData(dataId: DataId, force = false): boolean {\n  if (this.dataIdMap.has(dataId)) {\n    const data =\n      this.dataIdMap.get(dataId);\n    data.refCount--;\n    if (!force && data.refCount > 0) {\n      return false;\n    }\n\n    this.wasm._free(data.memoryOffset);\n    this.wasm.tfjs.disposeData(data.id);\n    this.dataIdMap.delete(dataId);\n  }\n  return true;\n}\n\n /** Return refCount of a `TensorData`. */\n refCount(dataId: DataId): number {\n  if (this.dataIdMap.has(dataId)) {\n    const tensorData =\n      this.dataIdMap.get(dataId);\n    return tensorData.refCount;\n  }\n  return 0;\n}\n\n incRef(dataId: DataId) {\n  const data = this.dataIdMap.get(dataId);\n  if (data != null) {\n    data.refCount++;\n  }\n}\n\n floatPrecision():\n 32 {\n  return 32;\n}\n\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n getMemoryOffset(dataId: DataId): number {\n  return this.dataIdMap.get(dataId).memoryOffset;\n}\n\n dispose() {\n  this.wasm.tfjs.dispose();\n  if ('PThread' in this.wasm) {\n    this.wasm.PThread.terminateAllThreads();\n  }\n  this.wasm = null;\n}\n\n memory() {\n  return {unreliable:\n  false};\n}\n\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n makeOutput(shape:\n  number[], dtype: DataType, memoryOffset?: number):\n  TensorInfo {\n  let dataId: {};\n  if (memoryOffset\n  == null) {\n    dataId = this.write(null /* values */, shape, dtype);\n  } else {\n    const id =\n      this.dataIdNextNumber++;\n    dataId = {id};\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,\n    refCount: 1});\n    const size = util.sizeFromShape(shape);\n    this.wasm.tfjs.registerTensor(id, size,\n    memoryOffset);\n  }\n  return {dataId, shape, dtype};\n}\n\n typedArrayFromHeap({shape, dtype, dataId}:\n  TensorInfo):\n  backend_util.TypedArray {\n  const buffer = this.wasm.HEAPU8.buffer;\n  const\n  {memoryOffset} = this.dataIdMap.get(dataId);\n  const size = util.sizeFromShape(shape);\n  switch (dtype) {\n  case 'float32':\n    return new Float32Array(buffer, memoryOffset, size);\n  case 'int32':\n    return new\n    Int32Array(buffer, memoryOffset, size);\n  case 'bool':\n    return new Uint8Array(buffer, memoryOffset,\n    size);\n  default:\n    throw new Error(`Unknown dtype ${dtype}`);\n  }\n}\n\nfunction\n  createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n  // minprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n    util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n      if (!response['ok']) {\n        imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n      response.arrayBuffer().then(binary => {\n        WebAssembly.instantiate(binary, imports).then(output => {\n          callback(output.instance, output.module);\n        });\n      });\n    });\n    return {};\n  };\n}\n\n /**\n * Returns the path of the WASM binary.\n * @param\n  simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM binaries.\n */\n function getPathToWasmBinary(\n  simdSupported: boolean, threadsSupported: boolean,\n  wasmModuleFolder: string) {\n  if (wasmPath != null) {\n    // If wasmPath is defined, the user has supplied a full path to\n    // the vanilla .wasm binary.\n    return\n    wasmPath;\n  }\n  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported &&\n  threadsSupported) {\n    path = 'tfjs-backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path =\n    'tfjs-backend-wasm-simd.wasm';\n  }\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n      return\n      wasmFileMap[path];\n    }\n  }\n  return wasmModuleFolder + path;\n}\n\n /**\n * Initializes the wasm module and creates the js <--> wasm bridge.\n * NOTE: We wrap the wasm module in a object with property\n * 'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in\n  Chrome 76).\n */\n export async function init(): Promise<{wasm: BackendWasmModule}> {\n  const\n  [simdSupported, threadsSupported] = await Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n  ]

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env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n ]);\n\n return new Promise((resolve, reject) =>
{\n  const factoryConfig: WasmFactoryConfig = {};\n  /**\n   * This function overrides the Emscripten
module locateFile utility.\n   * @param path The relative path to the file that needs to be loaded.\n   * @param
prefix The path to the main JavaScript file's directory.\n   */\n  factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n    const response = wasmWorkerContents;\n    const blob = new
Blob([response], {type: 'application/javascript'});\n    return URL.createObjectURL(blob);\n  }\n\n  if
(path.endsWith('.wasm')) {\n    return getPathToWasmBinary(\n      simdSupported as boolean,
threadsSupported as boolean,\n      wasmPathPrefix != null ? wasmPathPrefix : prefix);\n  }\n  return prefix
+ path;\n  };\n\n  // Use the instantiateWasm override when system fetch is not available.\n  // Reference:\n  //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n    factoryConfig.instantiateWasm =\n
createInstantiateWasmFunc(getPathToWasmBinary(\n      simdSupported as boolean, threadsSupported as
boolean,\n      wasmPathPrefix != null ? wasmPathPrefix : ''));\n  }\n\n  let initialized = false;\n
factoryConfig.onAbort = () => {\n    if (initialized) {\n      // Emscripten already called console.warn so no need to
double log.\n      return;\n    }\n    if (initAborted) {\n      // Emscripten calls `onAbort` twice, resulting in double
error\n      // messages.\n      return;\n    }\n    initAborted = true;\n    const rejectMsg =\n      'Make sure the
server can serve the `.wasm` file relative to the '+\n      'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n
reject({message: rejectMsg});\n  };\n\n  let wasm: Promise<BackendWasmModule>;\n  // If `wasmPath` has
been defined we must initialize the vanilla module.\n  if (threadsSupported && simdSupported && wasmPath ==
null) {\n    factoryConfig.mainScriptUrlOrBlob = new Blob(\n      [\n        var WasmBackendModuleThreadedSimd = `
+\n        wasmFactoryThreadedSimd.toString(),\n        {type: 'text/javascript'});\n    wasm =
wasmFactoryThreadedSimd(factoryConfig);\n  } else {\n    // The wasmFactory works for both vanilla and SIMD
binaries.\n    wasm = wasmFactory(factoryConfig);\n  }\n\n  // The WASM module has been successfully
created by the factory.\n  // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n    initialized = true;\n    initAborted = false;\n\n    const voidReturnType: string =
null;\n    // Using the tfjs namespace to avoid conflict with emscripten's API.\n    module.tfjs = {\n      init:
module.cwrap('init', null, []),\n      initWithThreadsCount:\n        module.cwrap('init_with_threads_count', null,
[number']),\n      getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n      registerTensor:
module.cwrap(\n        'register_tensor', null,\n        [\n          'number', // id\n          'number', // size\n
'number', // memoryOffset\n        ]),\n      disposeData: module.cwrap('dispose_data', voidReturnType,
[number']),\n      dispose: module.cwrap('dispose', voidReturnType, []),\n    };\n\n    resolve({ wasm: module });\n
  });\n\n  function typedArrayFromBuffer(\n    buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n    switch (dtype) {\n      case 'float32':\n        return new Float32Array(buffer);\n      case
'int32':\n        return new Int32Array(buffer);\n      case 'bool':\n        return new Uint8Array(buffer);\n      default:\n
throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n\n  const wasmBinaryNames = [\n    'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n    'tfjs-backend-wasm-threaded-simd.wasm'\n  ] as const;\n  ntype
WasmBinaryName = typeof wasmBinaryNames[number];\n\n  let wasmPath: string = null;\n  let wasmPathPrefix:
string = null;\n  let wasmFileMap: {[key in WasmBinaryName]?: string} = {};\n  let initAborted = false;\n  let
customFetch = false;\n\n  /**\n   * @deprecated Use `setWasmPaths` instead.\n   * Sets the path to the `.wasm` file
which will be fetched when the wasm\n   * backend is initialized. See\n   *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n   * for more
details.\n   * @param path wasm file path or url\n   * @param usePlatformFetch optional boolean to use platform fetch
to download\n   * the wasm file, default to false.\n   */\n  /**\n   * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\n  export function setWasmPath(path: string, usePlatformFetch = false): void {\n    deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and '+\n    ' will be removed in a future release.);\n
if (initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call '+\n

```



```

`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);
}
wasmPath = path;
customFetch =
usePlatformFetch;
}
}
/**
 * Configures the locations of the WASM binaries.
 * @param {Object} js setWasmPaths({
 *   'tfjs-backend-wasm.wasm': 'renamed.wasm',
 *   'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',
 *   'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'
 * });
 * @param {string} tf.setBackend('wasm');
 * @param {string|Object} prefixOrFileMap This can be either a string or object:
 *   - (string) The path to the directory where the WASM binaries are located.
 *   - (object) Mapping from names of WASM binaries to custom full paths specifying the locations of those binaries. This is useful if your WASM binaries are not all located in the same directory, or if your WASM binaries have been renamed.
 * @param {boolean} usePlatformFetch optional boolean to use platform fetch to download the wasm file, default to false.
 * @doc {heading: 'Environment', namespace: 'wasm'}
 * @export function setWasmPaths(prefixOrFileMap: string|{[key in WasmBinaryName]?: string}, usePlatformFetch = false): void {
 *   if (initAborted) {
 *     throw new Error('The WASM backend was already initialized. Make sure you call `setWasmPaths()` before you call `tf.setBackend()` or `tf.ready()`);
 *   }
 *   if (typeof prefixOrFileMap === 'string') {
 *     wasmPathPrefix = prefixOrFileMap;
 *   } else {
 *     wasmFileMap = prefixOrFileMap;
 *     const missingPaths = wasmBinaryNames.filter(name => wasmFileMap[name] === null);
 *     if (missingPaths.length > 0) {
 *       throw new Error(`There were no entries found for the following binaries: ` + missingPaths.join(','). Please either call setWasmPaths with a map providing a path for each binary, or with a string indicating the directory where all the binaries can be found.`);
 *     }
 *   }
 *   customFetch = usePlatformFetch;
 * }
 * Used in unit tests.
 * @export function resetWasmPath(): void {
 *   wasmPath = null;
 *   wasmPathPrefix = null;
 *   wasmFileMap = {};
 *   customFetch = false;
 *   initAborted = false;
 * }
 * @let threadsCount = -1;
 * @let actualThreadsCount = -1;
 * Sets the number of threads that will be used by XNNPACK to create threadpool (default to the number of logical CPU cores).
 * This must be called before calling `tf.setBackend('wasm')`.
 * @export function setThreadsCount(numThreads: number) {
 *   threadsCount = numThreads;
 * }
 * Gets the actual threads count that is used by XNNPACK.
 * It is set after the backend is initialized.
 * @export function getThreadsCount(): number {
 *   if (actualThreadsCount === -1) {
 *     throw new Error('WASM backend not initialized.');
```

```

"PThread\").threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\").threadCancel()}else
if(ex!==\"unwind!\"){if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){else{Module[\"PThread\").threadExit(ex.status)}}el
se{Module[\"PThread\").threadExit(-2);throw ex}}}}else
if(e.data.cmd===\"cancel!\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\").threadCancel()} }else
if(e.data.target===\"setimmediate!\"){ }else
if(e.data.cmd===\"processThreadQueue!\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()){}}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}};\"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm,
init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\n\nexport {version as version_wasm} from './version';\n\nconst
WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new
BackendWasm(wasm);\n}, WASM_PRIORITY);\n,\"/** @license See the LICENSE file. *\n\n// This code is
auto-generated, do not modify this file!\n\nconst version = '3.11.0';\n\nexport
{version};\n\n,\"names\":[\"CppType\",\"FusableActivation\",\"wasmFusedMatMul\",\"fusedMatMulConfig\",\"kernelNa
me\",\"_FusedMatMul\",\"backendName\",\"setupFunc\",\"backend\",\"wasm\",\"cwrap\",\"kernelFunc\",\"args\",\"inputs\",\"attrs
\",\"a\",\"b\",\"bias\",\"preluActivationWeights\",\"dtype\",\"Error\",\"transposeA\",\"transposeB\",\"activation\",\"leakyreluAlpha
\",\"aId\",\"dataIdMap\",\"get\",\"dataId\",\"id\",\"bId\",\"biasId\",\"biasData\",\"shape\",\"length\",\"preluActivationWeightsId\",\"fuse
dActivation\",\"leftDim\",\"rightDim\",\"batchDim\",\"out\",\"makeOutput\",\"outId\",\"aShapeBytes\",\"Uint8Array\",\"Int32Arr
ay\",\"buffer\",\"bShapeBytes\",\"createUnaryKernelConfig\",\"outType\",\"wasmFunc\",\"x\",\"xId\",\"util\",\"sizeFromShape
\",\"absConfig\",\"Abs\",\"createBinaryKernelConfig\",\"supportsFullBroadcast\",\"outputType\",\"newShape\",\"backend_util
\",\"assertAndGetBroadcastShape\",\"aBroadcastDims\",\"getBroadcastDims\",\"bBroadcastDims\",\"loopsOverAllOfA\",\"eve
ry\",\"v\",\"i\",\"loopsOverAllOfB\",\"addConfig\",\"Add\",\"addNConfig\",\"AddN\",\"inputIds\",\"map\",\"inputIdsBytes
\",\"identi
ty\",\"inVals\",\"typedArrayFromHeap\",\"set\",\"wasmTranspose\",\"identityConfig\",\"Identity\",\"transpose\",\"_a\",\"perm
\",\"n
ewPerm\",\"push\",\"minValIdx\",\"j\",\"reducedShape\",\"permIsNoOp\",\"outShape\",\"inShape\",\"Array\",\"computeOutShap
e\",\"cloned\",\"permBytes\",\"xShapeBytes\",\"wasmAll\",\"transposeConfig\",\"Transpose\",\"permuteAxesAndTranspose
\",\"axis\",\"xShape\",\"xRank\",\"originalAxes\",\"parseAxisParam\",\"axes\",\"permutedAxes\",\"getAxesPermutation
\",\"xTransp
osed\",\"inputWasTransposed\",\"getInnerMostAxes\",\"transposed\",\"wasmAny\",\"allConfig\",\"All\",\"keepDims\",\"inputId
\",\"input\",\"inputRank\",\"assertAxesAreInnerMostDims\",\"_b\",\"reduceShape\",\"reduceSize\",\"disposeData
\",\"expandSha
peToKeepDim\",\"anyConfig\",\"Any\",\"wasmAvgPool\",\"argMaxConfig\",\"ArgMax\",\"transposedId\",\"slice\",\"outerSize
\",\"innerSize\",\"avgPoolConfig\",\"AvgPool\",\"filterSize\",\"strides\",\"pad\",\"dimRoundingMode\",\"convInfo
\",\"computePoo

```

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No license file was found, but licenses were detected in source scan.

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*\n\n// Import core for side effects (e.g. flag registration)\nimport '@tensorflow/tfjs-core';\n\n// tslint:disable-next-line:no-imports-from-dist\nimport '@tensorflow/tfjs-core/dist/public/chained_ops/register_all_chained_ops';\n\n// tslint:disable-next-line: no-imports-from-dist\nimport '@tensorflow/tfjs-core/dist/register_all_gradients';\n\n// tslint:disable-next-line: no-imports-from-dist\nimport {setTestEnvs, setupTestFilters, TestFilter} from '@tensorflow/tfjs-core/dist/jasmine_util';\n\nsetTestEnvs([{\n  name: 'test-wasm',\n  backendName: 'wasm',\n  isDataSync: true\n}]);\n\n/*\n * Tests that have these substrings in their name will be included unless one\n * of the strings in excludes appears in the name.\n */\nconst TEST_FILTERS: TestFilter[] = [\n  {\n    startsWith: 'tensor',\n    excludes: [\n      'complex', // Complex numbers not supported yet\n      'derivative', // Gradients not yet supported\n      // Downcasting broken, see: https://github.com/tensorflow/tfjs/issues/2590\n      'Tensor2D float32 -> bool',\n      'Tensor2D int32 -> bool'\n    ]\n  },\n  {\n    include: 'softmax',\n    {\n      include: 'pow',\n      excludes: [\n        'gradient', // zerosLike not defined yet\n        'broadcasting same rank Tensors different shape', // Broadcasting along\n        // inner dims not\n        // supported yet.\n      ]\n    },\n    {\n      include: 'add',\n      excludes: [\n        'gradient', // Gradient is missing\n        'upcasts when

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dtypes dont match', // Uses the 'complex' dtype.\n    'complex',                // Complex numbers not supported
yet\n ]\n },\n {include: 'depthToSpace'},\n {\n include: 'avgPool',\n excludes: [\n 'gradient', // Not yet
implemented.\n 'avgPool3d', // Not yet implemented.\n ]\n },\n {\n include: 'relu',\n excludes: [\n
'derivative', // Not yet implemented.\n 'gradient', // Not yet implemented.\n
'valueAndGradients', // Not yet implemented.\n 'broadcasted bias', // Not yet implemented.\n 'fused A
x B with 2d bias' // Fused matMul with 2D bias not yet\n // supported.\n ]\n },\n {\n
include: 'maxPool',\n excludes: [\n 'maxPoolBackprop', // Not yet implemented.\n 'maxPool3d', //
Not yet implemented.\n 'maxPool3dBackprop', // Not yet implemented.\n 'ignores NaNs', // Actual !=
expected.\n 'maxPoolWithArgmax' // Not yet implemented.\n\n ]\n },\n {include: 'cropAndResize'},\n {\n
include: 'resizeBilinear',\n excludes: [\n 'gradients', // Not yet implemented.\n ]\n },\n {\n include: 'matmul'
,\n excludes: [\n 'valueAndGradients', // Gradients not defined yet\n 'gradient', // Gradients
not defined yet\n 'zero in its shape', // Zero in shapes aren't supported yet\n 'matmul followed by mul', //
mul not supported yet\n 'upcasts', // Upcasting not supported yet.\n 'fused A x B with 2d bias', //
Fused matMul with 2D bias not yet\n // supported.\n ]\n },\n {\n include:
'depthwiseConv2D',\n excludes: [\n 'broadcasted bias', // Broadcasted bias not yet supported.\n 'gradient',
// Gradients not defined yet.\n 'NCHW', // xnn pack does not support channels first.\n ]\n },\n {\n
include: 'conv2d',\n excludes: [\n 'broadcasted bias', // Broadcasted bias not yet supported.\n 'gradient',
// Gradients not defined yet.\n 'backProp input x=[2,3,3,1] f=[2,2,1,1] s=1 p=0', // Gradients not\n
// defined.\n 'NCHW', // xnn pack does not support channels first.\n // Issue:
https://github.com/tensorflow/tfjs/issues/3104.\n // Actual != expected.\n 'relu bias stride 2 x=[1,8,8,16]
f=[3,3,16,1] s=[2,2] d=8 p=same',\n 'prelu bias stride 2 x=[1,8,8,16] f=[3,3,16,1] s=[2,2] d=8 p=same',\n ]\n
},\n {include: 'conv2dTranspose', excludes: ['gradient']},\n {\n include: 'prelu',\n excludes: [\n 'gradient', //
Gradient is missing.\n 'derivative' // Missing gradient.\n ]\n },\n {\n include: 'cast',\n excludes: [\n
'complex', // Complex numbers not yet implemented.\n 'shallow slice an input that was cast' // Slice is not
implemented.\n ]\n },\n {\n include: 'gather',\n excludes: [\n 'gradient' // Not yet implemented.\n ]\n },\n
{\n include: 'sigmoid',\n excludes: [\n 'sigmoidCrossEntropy', // Not yet implemented.\n 'gradient'
// Not yet implemented.\n ]\n },\n {\n include: 'scatterND',\n {\n include: 'abs',\n excludes: [\n 'gradient',
// Not yet implemented.\n 'complex' // Complex numbers not supported yet.\n ]\n },\n {\n include: 'sub',\n
excludes: [\n 'complex', // Complex numbers not yet implemented.\n 'gradient', // Not yet implemented.\n
'upcasts', // Upcasting not supported yet.\n ]\n },\n {\n include: 'mul',\n excludes: [\n 'complex', //
Complex numbers not yet supported.\n 'gradient', // Gradient not defined yet.\n ]\n },\n {\n include: 'div',\n
excludes: [\n 'gradient', // Gradient not defined yet.\n 'upcasts', // Cast not supported yet.\n 'divNoNaN' //
divNoNaN not yet implemented.\n ]\n },\n {\n include: 'batchNorm',\n excludes: [\n 'gradient' // Gradient
is missing.\n ]\n },\n {\n include: 'slice',\n {\n include: 'stridedSlice',\n {\n include: 'rotate',\n {\n
include: 'rotateWithOffset',\n {\n include: 'flipLeftRight',\n {\n include: 'square',\n {\n include: 'squaredDifference',\n {\n
startsWith: 'min',\n excludes: [\n '2D, axis=0', // Permuted axes requires transpose, which is not yet\n
// implemented.\n 'index corresponds to start of a non-initial window', // argMin not yet\n
// implemented.,\n 'gradient' // Gradients not yet implemented\n ]\n },\n {\n startsWith: 'max',
\n excludes: [\n 'gradient' // Gradients not yet implemented\n ]\n },\n {\n include: 'concat',\n excludes:
[\n 'complex', // Complex numbers not supported yet\n 'gradient' // Split is not yet implemented\n ]\n },\n
{\n include: 'transpose',\n {\n include: 'oneHot',\n {\n include: 'split',\n {\n include: 'pad', excludes: ['complex',
'zerosLike']},\n {\n include: 'clip',\n excludes: [\n 'gradient',\n 'propagates NaNs' // clip delegates to
XNNPACK which does not make\n // guarantees about behavior of nans.\n ]\n },\n {\n include:
'addN',\n {\n include: 'nonMaxSuppression',\n {\n include: 'argmax', excludes: ['gradient']},\n {\n include: 'exp',\n {\n
include: 'elu',\n excludes: [\n 'derivative', // Not yet implemented.\n 'gradient', // Not yet implemented.\n
'selu' // Not yet implemented.\n ]\n },\n {\n include: 'unstack',\n {\n include: 'minimum',\n excludes: [\n
'gradient', // Not yet implemented.\n 'broadcasts 2x1 Tensor2D and 2x2 Tensor2D' //
Broadcasting along inner\n // dims not supported yet.\n ]\n },\n {\n include:

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'maximum',\n  excludes: [\n  'gradient', // Not yet implemented.\n  'broadcasts 2x1
Tensor2D and 2x2 Tensor2D' // Broadcasting along inner\n // dims not supported
yet.\n  ]\n },\n {\n  include: 'log',\n },\n {\n  startsWith: 'equal',\n  excludes: [\n  'broadcasting Tensor2D
shapes', // Broadcasting along outer dims not\n // supported yet.\n  'broadcasting
Tensor3D shapes', // Same as above.\n  'broadcasting Tensor4D shapes', // Same as above.\n  'string'\n  ]\n
},\n {\n  include: 'greater',\n  excludes: [\n  'broadcasting Tensor2D shapes', // Broadcasting along outer dims
not\n // supported yet.\n  'broadcasting Tensor3D shapes', // Same as above.\n
'broadcasting Tensor4D shapes', // Same as above.\n  'string'\n  ]\n },\n {\n  include: 'greaterEqual',\n
excludes: [\n  'gradient', // Not yet implemented.\n  'broadcasting Tensor2D shapes', //
Broadcasting along outer dims not\n // supported yet.\n  'broadcasting Tensor3D shapes',
// Same as above.\n  'broadcasting Tensor4D shapes', // Same as above.\n  'string'\n  ]\n },\n {\n  include:
'less',\n  excludes: [\n  'broadcasting Tensor2D shapes', // Broadcasting along outer dims not\n
// supported yet.\n  'broadcasting Tensor3D shapes', // Same as above.\n  'broadcasting Tensor3D
float32', // Same as above.\n  'broadcasting Tensor4D shapes', // Same as above.\n  'string'\n  ]\n },\n {\n
include: 'lessEqual',\n  excludes: [\n  'gradient', // Not yet implemented.\n  'broadcasting
Tensor2D shapes', // Broadcasting along outer dims not\n // supported yet.\n
'broadcasting Tensor3D shapes', // Same as above.\n  'broadcasting Tensor3D
float32', // Same as above.\n  'broadcasting Tensor4D shapes', // Same as above.\n  'string'\n  ]\n },\n {\n
include: 'notEqual',\n  excludes:
[\n  'broadcasting Tensor2D shapes', // Broadcasting along outer dims not\n // supported
yet.\n  'broadcasting Tensor3D shapes', // Same as above.\n  'broadcasting Tensor4D shapes', // Same as
above.\n  'string'\n  ]\n },\n {\n  include: 'mean',\n  excludes: [\n  'axis=0', // Reduction not supported
along inner dimensions.\n  ]\n },\n {\n  startsWith: 'reverse'},\n {\n  startsWith: 'sum'},\n {\n  startsWith: 'cumsum'},\n
{\n  startsWith: 'logicalAnd',\n  excludes: [\n  'broadcasting Tensor2D shapes', // Broadcasting along outer
dimensions\n // not yet supported.\n  'broadcasting Tensor3D shapes', // Same as above.\n
'broadcasting Tensor4D shapes', // Same as above.\n  ]\n },\n {\n  startsWith: 'tile',\n  excludes: [\n
'gradient', // Gradient not yet implemented.\n  'string tensor' // String tensors not yet implemented.\n  ]\n },\n
{\n  startsWith: 'sin'},\n {\n  startsWith: 'cos',\n  excludes: [\n  'gradient', // Gradient not yet implemented.\n  ]\n
},\n {\n  startsWith: 'cosh',\n  excludes: [\n  'gradient' // Gradient not yet implemented.\n  ]\n },\n {\n
startsWith: 'tan',\n  excludes: ['gradient'] // Gradient not yet implemented.\n\n },\n {\n  startsWith: 'tanh',\n
excludes: ['gradient'] // Gradient not yet implemented.\n },\n {\n  startsWith: 'rsqrt',\n  excludes: ['gradient'] //
Gradient not yet implemented.\n },\n {\n  startsWith: 'sqrt',\n  excludes: ['gradient'] // Gradient not yet
implemented.\n },\n {\n  startsWith: 'where',\n  excludes: [\n  '1D condition with higher rank a and b', // Fill
not yet implemented.\n  'gradient' // Gradient not yet implemented.\n  ]\n },\n {\n
startsWith: 'zerosLike',\n // Complex numbers not supported yet.\n  excludes: ['complex'],\n },\n {\n
startsWith: 'onesLike',\n // Complex numbers not supported yet.\n  excludes: ['complex'],\n },\n {\n  include:
'prod'},\n {\n  include: 'floor'},\n {\n  include: 'topk'},\n {\n  include: 'expandDims'},\n {\n  include: 'stack'},\n
{\n  include: 'round',\n // Pool is not supported yet.\n  excludes: ['pool'],\n },\n {\n  include: 'step kernel'},\n
{\n  include: 'ceil'},\n {\n  include: 'mirrorPad'},\n {\n  startsWith: 'all',\n  excludes: [\n  'ignores NaNs' // Doesn't yet ignore NaN\n
],\n },\n {\n  startsWith: 'any',\n  excludes: [\n  'ignores NaNs' // Doesn't yet ignore NaN\n  ]\n },\n {\n  include:
'image.transform'},\n {\n  include: 'batchToSpaceND'},\n {\n  include: 'spaceToBatchND'},\n ];\n\nconst customInclude =
(testName: string) => {\n // Include all regular describe() tests.\n if (testName.indexOf('test-wasm') < 0) {\n
return true;\n }\n // Include all of the wasm specific tests.\n if (testName.startsWith('wasm')) {\n return true;\n
}\n\n return false;\n};\n\nsetupTestFilters(TEST_FILTERS, customInclude);\n\n// Import and run all the tests from
core.\n\n// tslint:disable-next-line:no-imports-from-dist\n// tslint:disable-next-line:no-require-
imports\nrequire('@tensorflow/tfjs-core/dist/tests');\n"}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/setup_test.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"OnesLike.js","sourceRoot":"","sources":["../src/kernels/OnesLike.ts"],"names":[],"mappings":
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AC;IACpC,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,CAAC,KAAC,EAAE,CAAC,CAAC,KA
AK,CAAC,CAAC;IACjD,MAAM,OAAO,GAAG,OAAO,CAAC,kBAAkB,CAAC,GAAG,CAAC,CAAC;IAChD,
OAAO,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;IACkB,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,C
AAC,MAAM,cAAc,GAAsB;IAC1C,UAAU,EAAE,QAAQ;IACpB,WAAW,EAAE,MAAM;IACnB,UAAU,EAAE,
QAA4B;CACzC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const
onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as
{} as KernelFunc,\n};\n\n"]}
```

Found in path(s):

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/OnesLike.js.map

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```
/* Copyright 2019 Google LLC. All Rights Reserved.
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* distributed under the License is distributed on an "AS IS" BASIS,
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
* See the License for the specific language governing permissions and
* limitations under the License.
* =====*/
```

Found in path(s):

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/clamp_impl.cc
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/non_max_suppression_impl.h
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sub.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sigmoid_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/_FusedMatMul.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedDepthwiseConv2D.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Exp.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/CropAndResize.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/leakyrelu_impl.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/check_macros.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Mean.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/binary.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Softmax_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedConv2D.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prelu.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/AddN.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/transpose_impl.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/LogicalAnd.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/MaxPool.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/MaxPool_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prelu_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Multiply.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Reverse.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/transpose_impl.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/ClipByValue.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Tanh.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Min.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/conv2d_impl.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Conv2D_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Pow.cc

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/leakyrelu_impl.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/ScatterNd.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prelu.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/backend_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/AvgPool.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Cos.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sin.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/DepthwiseConv2dNative.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Conv2D.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Rsqrt.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sum.cc

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Minimum.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/conv2d_impl.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Square.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedConv2D_test.cc

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Gather.cc

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-

wasm/src/cc/kernels/Sigmoid.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/util.h
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/kernels/Log.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/kernels/AvgPool_test.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/non_max_suppression_impl.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/kernels/FusedConv2D.h
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/kernels/Tile.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/prelu_impl.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/kernels/LeakyRelu.h
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/kernels/ArgMax.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/src/cc/kernels/LessEqual.cc


```
const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const\nzerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike\n as {} as KernelFunc,\n};\n"}\n"}\n"
```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ZerosLike.js.map
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No license file was found, but licenses were detected in source scan.

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```

```
=====\n*\nimport { KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\nlet wasmStep:\n(xId: number, alpha: number, dtype: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n 'number', // alpha\n 'number', // dtype\n 'number', // out_id\n ]);\n}\nfunction step(\n args: {\n backend: BackendWasm,\n inputs: StepInputs,\n attrs: StepAttrs\n }): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { alpha } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId, alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step\n as {} as KernelFunc\n};\n"}\n"}\n"}\n"}\n"
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Step.js.map
```

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Softmax.js","sourceRoot":"","sources":["../../src/kernels/Softmax.ts"],"names":[],"mappings":"AAAA;::;GAeG;AAEH,OAAO,EAA2B,OAAO,EAA2C,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAIvH,IAAI
```

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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Softmax.js.map

No license file was found, but licenses were detected in source scan.

```
{ "version": 3, "file": "tf-backend-wasm.es2017.min.js", "sources": [ "../src/kernels/types.ts", "../src/kernels/_FusedMatMul.ts", "../src/kernels/unary_kernel.ts", "../src/kernels/Abs.ts", "../src/kernels/binary_kernel.ts", "../src/kernels/Add.ts", "../src/kernels/AddN.ts", "../src/kernels/Identity.ts", "../src/kernels/Transpose.ts", "../src/kernels/kernel_utils.ts", "../src/kernels/All.ts", "../src/kernels/Any.ts", "../src/kernels/ArgMax.ts", "../src/kernels/AvgPool.ts", "../src/kernels/Reshape.ts", "../src/kernels/BatchMatMul.ts", "../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js", "../src/kernels/Slice.ts", "../src/kernels/BatchToSpaceND.ts", "../src/kernels/Cast.ts", "../src/kernels/Ceil.ts", "../src/kernels/ClipByValue.ts", "../src/kernels/Concat.ts", "../node_modules/@tensorflow/tfjs-backend-
```

cpu/dist/kernels/Concat_impl.js","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/Range.ts","../node_modules/@tensorflow/tfjs-backend-

cpu/dist/kernels/Range_impl.js","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Softmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts","../src/kernels/Sum.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/Tile.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-

simd.worker.js","../src/base.ts","../src/version.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n  float32 = 0,\n  int32 = 1,\n  bool = 2,\n  string = 3,\n  complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n  linear = 0,\n  relu = 1,\n  relu6 = 2,\n  prelu = 3,\n  leakyrelu = 4,\n  sigmoid = 5,\n  elu = 6\n}\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { FusableActivation } from './types';\n\nlet wasmFusedMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number, biasId: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n
```



```

*\nimport { Abs, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n", "/*\n * @license\n
 * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport { backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { CppDType } from './types';\n\nexport
function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:
DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId:
number,\n    bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n    void;\n\n  function
setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /*
void */, [\n      'number', // a_id,\n      'array', // a_shape\n      'number', // a_shape.length\n      'number', // b_id\n
      'array', // b_shape\n      'number', // b_shape.length\n      'number', // dtype\n      'number' // out_id\n    ]);\n  }\n\n  function kernelFunc(args: { backend: BackendWasm, inputs: BinaryInputs }):\n    TensorInfo {\n    const { backend,
inputs } = args;\n    const { a, b } = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId =
backend.dataIdMap.get(b.dataId).id;\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape =
backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape,
outputType);\n\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return
out;\n    }\n\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes =
new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const kernelFunc = () => wasmFunc(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n      CppDType[a.dtype], outId);\n\n    // Currently only some float operations support full broadcast.\n    if
(supportsFullBroadcast && a.dtype === 'float32') {\n      kernelFunc();\n      return out;\n    }\n\n    const
aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims =
backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) =>
v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA &&
loopsOverAllOfB) {\n      kernelFunc();\n      return out;\n    } else {\n      throw new Error(\n        `Broadcasting
along outer dims is not yet ` +\n          `supported for ${a.dtype} ${kernelName}.`);\n    }\n  }\n\n  return
{ kernelName, backendName: 'wasm', setupFunc, kernelFunc }; }\n", "/*\n * @license\n
 * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport { Add, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\ncreateBinaryKernelConfig(Add, supportsFullBroadcast);\n", "/*\n * @license\n
 * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

```

governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n ]);\n}\nfunction addn(args: {inputs:\n TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n{TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nexport function\nidentity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =\n args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.toArrayFromHeap(x);\n const outVals = backend.toArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as\n KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed\n * on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {identity} from\n './Identity';\nimport {CppType} from './types';\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array,\n xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>\n void;\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n ]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs,\n backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better\n // due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,\n attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp = false;\n }\n }\n\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const
```



```

AllAttrs});\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,
null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,
attrs: AnyAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n
const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n
const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis,
backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n
input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n
backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAny(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-

```



```

core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {permuteAxesAndTranspose} from
 './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize:
number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n\n  function argmax(\n    args:
{inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n    const {backend, inputs, attrs} = args;\n
    const {axis} = attrs as {} as ArgMaxAttrs;\n    const {x} = inputs as {} as ArgMaxInputs;\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n
      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose
was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId =
transposedId;\n      }\n    }\n\n    const outShape = input.shape.slice(0, -1);\n    const out =
backend.makeOutput(outShape, 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const outerSize =
util.sizeFromShape(out.shape);\n    const innerSize = input.shape[axes[0]];\n    wasmFunc(inputId,
CppType[input.dtype], outerSize, innerSize, outId);\n\n    if (inputWasTransposed) {\n      // dispose of the
transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    return out;\n  }\n\n  export const
argMaxConfig: KernelConfig = {\n    kernelName: ArgMax,\n    backendName: 'wasm',\n    kernelFunc: argmax as {}
as KernelFunc,\n    setupFunc: setup\n  };}\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n
    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n
    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n
    'number', // strideHeight\n    'number', // strideWidth\n    'number', // channels\n    'number', // outId\n  ]);\n\n  function
avgPool(\n    args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n    const {inputs, attrs,
backend} = args;\n\n    const x = inputs.x as Tensor4D;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n\n    const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n    const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n    const filterHeight =
convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft =
convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n
`wasm backend does not support dataFormat: ` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n
    }\n\n    if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n      throw new Error(\n
`was backend
only supports average pooling with dilation = [1, 1], ` +\n      `got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n    }\n\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmAvgPool(\n      xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n      padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n

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outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: avgPool as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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\n
*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n  args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n\n  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n      `shape must have the same number of elements.`);\n\n  // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'wasm',\n  kernelFunc: reshape as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====
\n
*/\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n\n  function batchMatMul(args: {\n    inputs: BatchMatMulInputs,\n    backend: BackendWasm,\n    attrs: BatchMatMulAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {a, b} = inputs;\n    const {transposeA, transposeB} = attrs;\n\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(\n        `BatchMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const aRank = a.shape.length;\n    const bRank = b.shape.length;\n\n    const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n    const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n    const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n    const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n    const outerDimsA = a.shape.slice(0, -2);\n    const outerDimsB = b.shape.slice(0, -2);\n\n    const batchDimA = util.sizeFromShape(outerDimsA);\n    const batchDimB = util.sizeFromShape(outerDimsB);\n\n    const batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n    util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input batch dimensions must either be the ` +\n        `same or at least one input batch dimension must be 1. Got input ` +\n        `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n    const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n    const outShape =\n      outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n    util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n        ` ${innerShapeB}) of Tensors with shapes

```


ZW5kQ1BVfSBmcm9tICcuLi9iYWNrZW5kX2NwdSc7XG5pbXBvcnQge2Fzc2VydE5vdENvbXBsZXh9IGZyb2
0gJy4uL2NwdV91dGlsJztcb1xuZXhw3J0IGZ1bmN0aW9uIHNsaWNISW1wbChcbiAgICB2YWxzOiBCYWNrZ
W5kVmfSdVWzLcBiZWdpbjogbnVtYmV5W10sIHNPemU6IG51bWJlcldLCBzaGFwZTogbnVtYmV5W10sXG
4gICAgZHR5cGU6IERhdGFUeXBIKTogQmFja2VuZFZhbHVlcYyB7XG4gIGNvbnN0IGlzQ29udGlub3VzID0gc2
xpY2VfdXRpbC5pc1NsaWNiQ29udGlub3VzKHNoYXBILCBiZWdpbiwgc2I6ZSk7XG4gIGNvbnN0IGxlbmd0aC
A9IHV0aWwuc2I6ZUZYb21TaGFwZShzaXpKtTcbiAgY29uc3QgeFN0cmklZXMGpSB1dGlsLmNvbXB1dGVTd
HJpZGVzKHNoYXBIKTtcb1xucBpZiAoaXNDb250aW5vdXMPiHTcbiAgICBjb25zdCBmbGF0T2Zmc2V0ID0gc
2xpY2VfdXRpbC5jb21wdXRIRmxhdE9mZnNldChiZWdpbiwgcFN0cmklZXMGpO1xuXG4gICAgYWYgKGR0eX
BliID09PSAnc3RyaW5nJykge1xuICAgICAgcmV0dXJuICk2YWxzIGFzIFVpbnQ4QXJyYXl5bXSkuc2xpY2UoZmx
hdE9mZnNldCwgZmxhdE9mZnNldCArIGxlbmd0aCk7XG4gICAgfVxuXG4gICAgcmV0dXJuICk2YWxzIGFzIF
R5cGVkQXJyYXkplLnN1YmFycmF5KGZsYXRPZmZzZXQsIGZsYXRPZmZzZXQgKyBsZW5ndGppO1xuICB9
XG5cbiAgY29uc3QgZGVjb2RiZERhdGEGpSBkdHlwZSA9PT0gJ3N0cmZycyP1xuICAgICAgYmFja2VuZF91d
GlsLmZyb21VaW50FRvU3RyaW5nQXJyYXkodmFscyBhcyBvaW50EfyemF5W10pIDpcbiAgICAgIHZhbH
MgYXMGVHlwZWRBcnJheTtcb1xucBpb25zdCBpbk1JiA9IGJ1ZmZlcihzaGFwZSwgZHR5cGU6IGRlY29kZW
REYXRhKTtcbiAgY29uc3Qgb3V0QnVmID0gYnVmZmV5KHNPemUsIGR0eXBIKTtcbiAgZm9yIChsZXQgaSA
9IDA7IGkgPCBvdXRcdWYuc2I6ZTsKytpKSB7XG4gICAgY29uc3Qgb3V0TG9jID0gb3V0QnVmLmluZGV4V
G9Mb2MoasK7XG4gICAgY29uc3QgaW5Mb2MgPSBvdXRmb2MubWFWKChpZHG6IG51bWJlcWgaikgPT4ga
WR4ICsgYmVnaW5bal0pO1xuICAgIG91dEJ1Zi5ZkXQoaW5CdWYuZ2V0KC4uLmluTG9jKSwGLi4ub3V0TG9j
KTtcbiAgfVxuXG4gIGlmICkhdHlwZSA9PT0gJ3N0cmZucyZycyP1xucBjb25zdCBpZm9jYm9jaW50EfyemF5W10pIDp
cBiAgICAgIHZhbHMGVHlwZWRBcnJheTtcbn1cblxuZXhw3J0IGZ1bmN0aW9uIHNsaWNiKFxu
ICAgIGFyZ3M6IHtpbnB1dHM6IFNsaWNISW5wdXRzLcBiYWNrZW5kOiBNYXR0QmFja2VuZENQVSwgYX
R0cnM6IFNsaWNiQR0cnN9KTpcbiAgICBUZW5zb3JlbnZvIHtcbiAgY29uc3Qge2lucHV0cywgYmFja2VuZC
wgYXR0cnN9ID0gYXJncztcBiAgY29uc3Qge3h9ID0gaW5wdXRzO1xuICBjb25zdCB7YmVnaW5sIHNPemV9ID
0gYXR0cnM7XG5cbiAgYXNzZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcb1xucBjb25zdCBbJGJlZ2luLCAk
c2I6ZV0gPSBzbGJlZV91dGlsLnBhcnN1U2xpY2VQYXJhbXMOeCwgYmVnaW5sIHNPemUpO1xuICBzbGJlZV9
1dGlsLmFzc2VydFBhcMf1c1ZhbGlkKHGsICRiZWdpbiwgcJHNpemUpO1xuXG4gIGNvbnN0IHZhbHMgPSBiYW
NrZW5kLmRhdGEuZ2V0KHguZGF0YUllkKS52YWx1ZmM7XG4gIGNvbnN0IG91dFZhbHMgPSBzbGJlZUlcG
wodmFscywJGJlZ2luLCAkc2I6ZSwgc5zaGFwZSwgc5kdHlwZSk7XG4gIHJldHVybiBiYWNrZW5kLm1ha2
VUZW5zb3JlbnZvKCRzaXpLcB4LmR0eXBIcBvdXRWYWxzKtTcbn1cblxuZXhw3J0IGNvbnN0IHNsaWN
IQ29uZmlnOibLZkXJuZwXDb25maWcgPSB7XG4gIGtlcm51bE5hbWU6IFNsaWNiLFxuICBiYWNrZW5kTmFtZ
TogJ2NwdScsXG4gIGtlcm51bEZ1bmM6IHNSaWNlIGFzIHt9IGFzIEtlcm51bEZ1bmNcbn07XG4iXX0=", "/>**\n *
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the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n */>\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}  
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {sliceImplCPU} from  
 './kernel_utils/shared';\nnext function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:  
BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n  const [begin_, size_] =  
  slice_util.parseSliceParams(x, begin, size);\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,  
  size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const  
  xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n  if (isContinuous)  
  {\n    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n    if (x.dtype === 'string') {\n      outData.stringBytes =\n        (xVals as Uint8Array[]).slice(flatOffset, flatOffset +
```

```

util.sizeFromShape(size_));\n } else {\n  const outVals = backend.toArrayFromHeap(out);\n  outVals.set(\n    (xVals as TypedArray)\n    .subarray(flatOffset, flatOffset +\n    util.sizeFromShape(size_));\n  }\n  return out;\n }\n if (x.dtype === 'string') {\n  const res =\n  sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n  outData.stringBytes = res as Uint8Array[];\n  return\n  out;\n }\n const outVals = backend.toArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2)\n {\n  slice2d(\n    xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n    size_ as [number, number]);\n } else if (rank === 3) {\n  slice3d(\n    xVals as TypedArray, xStrides[0], xStrides[1],\n    outVals,\n    begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)\n {\n  slice4d(\n    xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n    begin_ as [number,\n    number, number, number],\n    size_ as [number, number, number, number]);\n } else {\n  const res =\n  sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n  outVals.set(res);\n }\n return\n  out;\n }\n\nfunction slice2d(\n  xVals: backend_util.TypedArray, xStride: number,\n  outVals:\n  backend_util.TypedArray, begin: [number, number],\n  size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI;\n  i++) {\n  const xOffset = i * xStride + beginJ;\n  outVals.set(xVals.subarray(xOffset, xOffset + size[1]),\n  outOffset);\n  outOffset += size[1];\n }\n}\n\nfunction slice3d(\n  xVals: backend_util.TypedArray, xStride1:\n  number, xStride2: number,\n  outVals: backend_util.TypedArray, begin: [number, number, number],\n  size:\n  [number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i <\n  endI; i++) {\n  for (let j = beginJ; j < endJ; j++) {\n  const xOffset = i * xStride1 + j * xStride2 + beginK;\n  outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n  outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n  xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n  xStride3:\n  number, outVals: backend_util.TypedArray,\n  begin: [number, number, number, number],\n  size: [number,\n  number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK\n  + size[2];\n  const beginL = begin[3];\n  for (let i = beginI; i < endI; i++) {\n  for (let j = beginJ; j < endJ; j++)\n  {\n  for (let k = beginK; k < endK; k++) {\n  const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +\n  beginL;\n  outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n  outOffset += size[3];\n }\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as { } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2021 Google LLC. All Rights\n  Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n  except in compliance with the License.\n * You may obtain a copy of the License at\n *\n  http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *\n  =====\n  *\n  \nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,\n  KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport\n  { reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction\n  batchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: BackendWasm,\n  attrs:\n  BatchToSpaceNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockSize,\n  crops } = attrs;\n  const prod = blockSize.reduce((a, b) => a * b);\n  const reshaped =\n  backend_util.getReshaped(x.shape, blockSize, prod);\n  const permuted =\n  backend_util.getPermuted(reshaped.length, blockSize.length);\n  const reshapedPermuted =\n  backend_util.getReshapedPermuted(x.shape, blockSize, prod);\n  const sliceBeginCoords =\n  backend_util.getSliceBeginCoords(crops, blockSize.length);\n  const sliceSize =\n  backend_util.getSliceSize(reshapedPermuted, crops, blockSize.length);\n  const xReshaped = reshape({ inputs:

```

```
{x}, backend, attrs: {shape: reshaped});\n const xTransposed =\n  transpose({inputs: {x: xReshaped}, backend,\n  attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n  {inputs: {x: xTransposed}, backend,\n  attrs: {shape: reshapedPermuted}});\n const result = slice({\n  inputs: {x: xTransposedReshaped},\n  backend,\n  attrs: {begin: sliceBeginCoords, size: sliceSize}\n  });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return\n result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

```

```
=====\n\n*\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function\n cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm};\n  TensorInfo {\n    const {inputs:\n    {x}, attrs: {dtype}, backend} = args;\n    const out = backend.makeOutput(x.shape, dtype);\n    const inVals =\n    backend.toArrayFromHeap(x);\n    const outVals = backend.toArrayFromHeap(out);\n    outVals.set(inVals);\n    return out;\n  })\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

```

```
=====\n\n*\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n '../unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

```

```
=====\n\n*\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =\n  backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number', // x_id\n    'number', // min\n    'number', //\n    max\n    'number' // out_id\n  ]);\n\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend:\n    BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =\n    backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId,\n    clipValueMin, clipValueMax, outId);\n    return out;\n  }\n\n  export const clipByValueConfig: KernelConfig = {\n    kernelName: ClipByValue,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: clip as {} as\n    KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the

```

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```
=====
*
import { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from
 '@tensorflow/tfjs-core';
import { BackendWasm } from '../backend_wasm';
import { concatImplCPU } from
 '../kernel_utils/shared';
import { identity } from './Identity';
import { reshape } from './Reshape';
export function
concat(
  args: { inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs }
) {
  const { inputs, backend }
= args;
  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];
  let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);
  // Keep only non-empty tensors (ignore tensors
with 0 in their shape).
  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);
  if ($inputs.length ===
1) {
    return identity({ inputs: { x: $inputs[0] }, backend });
  }
  const out = backend.makeOutput(outShape,
inputs[0].dtype);
  if (util.sizeFromShape(outShape) === 0) {
    return out;
  }
  const shapes =
$inputs.map(t => t.shape);
  backend_util.assertParamsConsistent(shapes, axis);
  if ($inputs[0].dtype ===
'string') {
    // Any concat of n-dimensional tensors across any axis can be reduced to
    // a concatenation of two-
dimensional tensors across the axis 1 by first
    // partitioning the axes of the original tensors into those less than
    // axis to be concatenated and the rest. Then reshape the tensors
    // into a two-dimensional tensor by
collapsing these two sets of axes and
    // concatenate the resulting matrices across the axis 1, finally reshaping
    // the result to have the proper shape.
    const inputs2D = $inputs.map(t => {
      const innerSize =
util.sizeFromShape(t.shape.slice(axis));
      const shape = [-1, innerSize];
      return reshape({ inputs: { x: t },
backend, attrs: { shape } });
    });
    const inputsValShapes = inputs2D.map(t => {
      return { vals:
backend.readSync(t.dataId, shape: t.shape);
});
    // Concat 2d tensors along axis=1.
    outShape =
backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);
    const simplyConcat =
inputs2D[0].shape[0] === 1;
    const outVals = concatImplCPU(
      inputsValShapes, outShape,
inputs[0].dtype,
      simplyConcat) as string[];
    const finalOutShape =
backend_util.computeOutShape($inputs.map(t => t.shape), axis);
    out.shape = finalOutShape;
    const
outData = backend.dataIdMap.get(out.dataId);
    outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);
    inputs2D.forEach(t => backend.disposeData(t.dataId));
    return out;
  }
  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));
  let sumInnerDims =
0;
  const innerDims = $inputs.map(input => {
    const innerDim = util.sizeFromShape(input.shape.slice(axis));
    sumInnerDims += innerDim;
    return innerDim;
  });
  const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));
  const outVals = backend.typedArrayFromHeap(out);
  for (let b = 0; b <
batchDim; b++) {
    let outOffset = b * sumInnerDims;
    for (let i = 0; i < inVals.length; i++) {
      const
innerDim = innerDims[i];
      const inOffset = b * innerDim;
      const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);
      outVals.set(vals, outOffset);
      outOffset += innerDim;
    }
  }
  return
out;
}
export const concatConfig: KernelConfig = {
  kernelName: Concat,
  backendName: 'wasm',
  kernelFunc: concat as { } as KernelFunc,
};
/**
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WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language
governing permissions and
 * limitations under the License.

```

```
=====
*
import { backend_util, util } from '@tensorflow/tfjs-core';
export function concatImpl(inputs, outShape, dtype,
```



```

=== 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n     `wasm backend
Conv2D does not support dataFormat:` +\n     `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n   filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: conv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n  outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n  xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride:
number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n ];\n}\n\nfunction conv2DBackpropInput(args: {\n  backend:
BackendWasm,\n  inputs: Conv2DBackpropInputInputs,\n  attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const { backend, inputs, attrs } = args;\n const { dy, filter } = inputs;\n const { strides, pad, dataFormat,
dimRoundingMode, inputShape } = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n  batchSize,\n  filterHeight,\n  filterWidth,\n  inChannels,\n
inHeight,\n  inWidth,\n  outChannels,\n  outHeight,\n  outWidth,\n  strideHeight,\n  strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n

```

```

wasmConv2DBackpropInput(\n    dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n    inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n    topPad, leftPad, fltS0, fltS1, fltS2,\n    xBatchStride, xRowStride,\n    xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n    yChannelStride, outId);\n    return out;\n);\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n    kernelName: Conv2DBackpropInput,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:\n    conv2DBackpropInput as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,\n TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { cast }\n from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n    bilinear = 0,\n    nearest\n = 1\n}\n\nlet wasmCropAndResize: (\n    imagesId: number, boxesId: number, boxIndId: number, numBoxes:\n    number,\n    imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n    method: number,\n    extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n    wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n        'number', // imagesId\n        'number', // boxesId\n        'number', // boxIndId\n        'number', // numBoxes\n        'array', // images shape\n        'number',\n        // cropHeight\n        'number', // cropWidth\n        'number', // method\n        'number', // extrapolation value\n        'number'\n        // out id\n    ]);\n\n    function cropAndResize(args: {\n        backend: BackendWasm,\n        inputs: CropAndResizeInputs,\n        attrs: CropAndResizeAttrs\n    }): TensorInfo {\n        const { backend, inputs, attrs } = args;\n        const { method,\n            extrapolationValue, cropSize } = attrs;\n        const { image, boxes, boxInd } = inputs;\n        const numBoxes =\n            boxes.shape[0];\n        const [cropHeight, cropWidth] = cropSize as [number, number];\n        const outShape =\n            [numBoxes, cropHeight, cropWidth, image.shape[3]];\n        let imagesData =\n            backend.dataIdMap.get(image.dataId);\n        let castedData;\n        if (image.dtype !== 'float32') {\n            castedData =\n                cast({ backend, inputs: { x: image }, attrs: { dtype: 'float32' }});\n            imagesData =\n                backend.dataIdMap.get(castedData.dataId);\n        }\n        const imagesId = imagesData.id;\n        const boxesId =

```

```

backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const
out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const
imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n
imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n  cropWidth,\n
InterpolationMethod[method as { } as keyof typeof InterpolationMethod],\n  extrapolationValue, outId);\n\n if
(castedData != null) {\n  backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
cropAndResizeConfig: KernelConfig = {\n  kernelName: CropAndResize,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: cropAndResize as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util }
from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from
 './types';\n\nimport { transpose } from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n  finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n    'number', // x_id\n    'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n    'number' //
dtype\n  ]);\n}\n\nexport function cumsum(\n  args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs});\n\nTensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis,
exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n  util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n    () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n  // permute required axis
to inner most axis\n  const permutation = backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if
(permutation !== null) {\n    permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n  const
permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n  const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n  const finalDim = permutedX.shape[permutedAxis];\n  const
permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n    permutedOutId, CppDType[x.dtype]);\n  // transpose data back if permuted\n  let out =
permutedOut;\n  if (permutation !== null) {\n    const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n    out = transpose(\n      {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n    backend.disposeData(permutedX.dataId);\n  }\n  backend.disposeData(permutedOut.dataId);\n}\n\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as { } as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmDepthToSpace:

```

```

(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction\nsetup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null\n/*void*/, [\n  'number', // xId\n  'number', // blockSize\n  'number', // channelsLast\n  'array', // xStrides\n  'number', // xStridesLength\n  'array', // outputShape\n  'array', // outputStrides\n  'number', // outSize\n  'number', // outId\n  ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs: DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth = inputDepth / (blockSize * blockSize);\n\n  const outputShape = (dataFormat === 'NHWC') ?\n    [batchSize, outputHeight, outputWidth, outputDepth] :\n    [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const out = backend.makeOutput(outputShape, 'float32');\n  const xData = backend.dataIdMap.get(x.dataId);\n  const xId = xData.id;\n  const xStridesBytes =\n    new Uint8Array(new\nInt32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new\nInt32Array(outputShape).buffer);\n  const outStridesBytes =\n    new Uint8Array(new\nInt32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  wasmDepthToSpace(\n    xId, blockSize, channelsLast,\n    xStridesBytes, x.shape.length - 1,\n    outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n  return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,\nDepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from './backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,\n  inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop:\nnumber,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight:\nnumber, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number,\n  outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n    backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n    'number', //\n  xId\n  'number', // batchSize\n  'number', // inputHeight\n  'number', // inputWidth\n  'number', //\n  filterId\n  'number', // filterHeight\n  'number', // filterWidth\n  'number', // padTop\n  'number', //\n  padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', // isSamePad\n  'number', //\n  dilationHeight\n  'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number', // inputChannels\n  'number', // outputChannels\n  'number', // outId\n  ]);\n}\n\nfunction\ndepthwiseConv2d(args: {\n  inputs: DepthwiseConv2dNativeInputs,\n  backend: BackendWasm,\n  attrs: DepthwiseConv2dNativeAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const\n  {strides, dilations, pad, dimRoundingMode} = attrs;\n  const $dilations = dilations === null ? [1, 1] : dilations;\n  const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape,\n    strides,\n    ($dilations as number | [number, number]), pad, dimRoundingMode,\n    true /* depthwise */);\n}

```

```

const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop =
convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n     `wasm backend DepthwiseConv2dNative
does not support dataFormat:` +\n     `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n   filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n  kernelName: DepthwiseConv2dNative,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n\n"/**\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} =
attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if
(dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n ) => `Axis must be in the interval [${- (inputRank + 1)}, ${\n inputRank}]);\n $dim = inputRank + dim
+ 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape:
newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n
backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {Fill, FillAttrs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function fill(args: {attrs:
FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out =
backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as
number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName:
'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch:
number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', //
imageWidth\n 'number', // numChannels\n 'number', // outId\n ]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n
const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId =
backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch,
imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as
KernelFunc,\n setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number, varianceEpsilon: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number', 'number', 'number', 'number', 'number'];\n  );\n  function fusedBatchNorm(args: {\n    backend: BackendWasm,\n    inputs: FusedBatchNormInputs,\n    attrs: FusedBatchNormAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {varianceEpsilon} = attrs;\n    const {x, mean, variance, offset, scale} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const meanId = backend.dataIdMap.get(mean.dataId).id;\n    const varianceId = backend.dataIdMap.get(variance.dataId).id;\n    const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n    const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n    const out = backend.makeOutput(x.shape, x.dtype);\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(x.shape) === 0) {\n      return out;\n    }\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmBatchNorm(\n      xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n    return out;\n  }\n  export const fusedBatchNormConfig: KernelConfig = {\n    kernelName: FusedBatchNorm,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: fusedBatchNorm as {\n      KernelFunc\n    };\n  };\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport
```

```

{FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n  (xId: number, batchSize: number, inputHeight:\n  number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number,\n  padTop: number, padRight: number, padBottom: number,\n  padLeft: number, isSamePad: number,\n  dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels: number, activation: number,\n  preluActivationWeightsId: number,\n  leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', // preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\n  function\n  fusedConv2d(args: {\n    inputs: FusedConv2DInputs,\n    backend: BackendWasm,\n    attrs: FusedConv2DAttrs\n  })\n  {\n    const {inputs, attrs, backend} = args;\n    const {x, filter, bias, preluActivationWeights} = inputs;\n    const {\n      strides,\n      pad,\n      dilations,\n      dataFormat,\n      dimRoundingMode,\n      activation,\n      leakyreluAlpha\n    } =\n      attrs;\n\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as\n      Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode);\n\n    const fusedActivation =\n      FusableActivation[activation as {}] as keyof typeof FusableActivation;\n\n    if (fusedActivation == null) {\n      throw\n      new Error(\n        ` ${activation} activation not yet supported for FusedConv2D ` +\n        `in the wasm backend.`);\n    }\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId =\n      backend.dataIdMap.get(filter.dataId).id;\n\n    const outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n\n    if (bias != null) {\n      const biasData = backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `FusedConv2D only supports rank-1 bias but got ` +\n          `rank\n          ${biasData.shape.length}`);\n      }\n      if (biasData.shape[0] !== outputChannels) {\n        throw new Error(\n          `FusedConv2D bias shape (${biasData.shape}) does not ` +\n          `match the number of output channels\n          (${outputChannels})`);\n      }\n      biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const\n    filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight =\n      convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const\n    strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =\n      convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize =\n      convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if\n    (dataFormat !== 'NHWC') {\n      throw new Error(\n        `wasm backend FusedConv2D does not support\n        dataFormat:` +\n        ` ${dataFormat}'. Please use 'NHWC'.`);\n    }\n\n    const out =\n      backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const\n    preluActivationWeightsId = preluActivationWeights == null ?\n      0 :\n      backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n    wasmFusedConv2d(\n      xId, batchSize, inHeight,\n      inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight,\n      dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n      fusedActivation,\n      preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n    return out;\n  }\n\n  export const fusedConv2DConfig:\n  KernelConfig = {\n    kernelName: FusedConv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:\n    fusedConv2d as {} as KernelFunc\n  };
\n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights\n   * Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you may not use this file\n   * except in compliance with the License.\n   * You may obtain a copy of the License at\n   * \n   * http://www.apache.org/licenses/LICENSE-2.0\n   * \n   * Unless required by applicable law or agreed to in writing,\n   * software\n   * distributed under the License is distributed on an "AS IS"\n   * BASIS,\n   * WITHOUT WARRANTIES\n   * OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language

```

governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,  
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\nimport  
{ BackendWasm } from './backend_wasm';\nimport { FusibleActivation } from './types';\nlet  
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:  
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:  
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //  
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //  
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //  
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //  
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //  
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\n  function  
fusedDepthwiseConv2d(args: {\n    inputs: FusedDepthwiseConv2DInputs,\n    backend: BackendWasm,\n    attrs:  
FusedDepthwiseConv2DAttrs\n  }) {\n    const { inputs, attrs, backend } = args;\n    const { x, filter, bias,  
preluActivationWeights } = inputs;\n    const {\n      strides,\n      pad,\n      dilations,\n      dataFormat,\n      dimRoundingMode,\n      activation,\n      leakyreluAlpha\n    } = attrs;\n\n    const convInfo =  
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, true /* depthwise */);\n\n    const fusedActivation =\n      FusibleActivation[activation as {\n        as keyof typeof FusibleActivation\n      }];\n    if (fusedActivation == null) {\n      throw new Error(\n        `${activation}  
activation not yet supported for FusedDepthwiseConv2D` +\n        `in the wasm backend.`);\n    }\n\n    const xId =  
backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const  
outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n    if (bias != null) {\n      const biasData =  
backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n          `rank ${biasData.shape.length}`);\n      }\n      if (biasData.shape[0] !== outputChannels) {\n        throw new Error(\n          `FusedDepthwiseConv2D bias shape  
(${biasData.shape}) does not ` +\n          `match the number of output channels (${outputChannels})`);\n      }\n      biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =  
convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const  
padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight =  
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight =  
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =  
convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize =  
convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if  
(dataFormat !== 'NHWC') {\n      throw new Error(\n        `wasm backend FusedDepthwiseConv2D does not support  
dataFormat:` +\n        `${dataFormat}`. Please use 'NHWC'.`);\n    }\n\n    const out =  
backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const  
preluActivationWeightsId = preluActivationWeights == null ?\n      0 :  
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n    wasmFusedDepthwiseConv2d(\n      xId, batchSize,  
inHeight, inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft,  
isSamePad, dilationHeight,\n      dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n      fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n    return out;\n  }\n\n  export const  
fusedDepthwiseConv2DConfig: KernelConfig = {\n    kernelName: FusedDepthwiseConv2D,\n    backendName:
```

'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet\nwasmGatherNd: (\n  xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n  sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n    'number', // xId\n    'number', // dtype\n    'number', // indicesId\n    'number', // numSlices\n    'number', // sliceRank\n    'number', // sliceSize\n    'array', // strides\n    'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} = inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params, indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n    return out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n  const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new\n    Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmGatherNd(\n    xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n    stridesBytes, outId);\n\n  return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherNd\n};\n", "/*\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,\n  TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from\n  '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {CppType} from './types';\n\nlet\nwasmGather:\n  (\n    xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n    indicesId: number, batchSize: number, outStrides: Uint8Array,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n    'number', // xId\n    'number', // dtype\n    'array', // xStrides\n    'number', // stridesSize\n    'number', // indicesId\n    'number', // batchSize\n    'array', //\n    outStrides\n    'number' // outId\n  ]);\n}\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x, indices} = inputs;\n  const {axis, batchDims} = attrs;\n\n  // Throw error when any index is out of bound.\n  const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as\n    TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n    const index\n      = indicesVals[i];\n    util.assert(\n      index <= axisDim - 1 && index >= 0,\n      () =>`\n        GatherV2: the\n        index value ${index} is not in [0, ${axisDim - 1}]\n      `);\n  }\n\n  const shapeInfo =\n    backend_util.segment_util.collectGatherOpShapeInfo(\n      x as Tensor, indices as Tensor, parsedAxis,\n      batchDims);\n\n  const flattenX = reshape({\n    inputs: {x},\n    attrs: {\n      shape: [\n        shapeInfo.batchSize,
```

```

shapeInfo.outerSize, shapeInfo.dimSize,\n    shapeInfo.sliceSize\n    ]\n },\n backend\n });\n const
indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape =
[\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n ];\n\n
const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n\n const stridesSize = flattenX.shape.length - 1;\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n }\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n", "/**\n
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copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig }
from '/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from
'/types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
out_id\n ]);\n\n\nexport function leakyRelu(\n args: \n {inputs: LeakyReluInputs, attrs: LeakyReluAttrs,

```


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```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function max(args: { backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs }):\n    TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { reductionIndices: axis, keepDims } = attrs;\n    const { x } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const { transposed, axes, originalAxes, inputWasTransposed } =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      input = transposed;\n      inputId = transposedId;\n    }\n\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n\n    const reduceSize = util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    return out;\n  }\n\n  export const maxConfig: KernelConfig = {\n    kernelName: Max,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: max as { } as KernelFunc\n  }; \n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,\n   * software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the License.\n   */\n}
```

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=====\n*\n\nimport { KernelConfig, Maximum } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const maximumConfig: KernelConfig =\n  createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,\n   * software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the License.\n   */\n}
```

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmMaxPool: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number, dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
```

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backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', //
inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', //
padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number',
// inputChannels\n 'number', // outputChannels\n 'number', // outId\n ]);\n}\n\nfunction maxPool(\n args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n /\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n /\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n
backend.wasm.cwrap(Mean, null /*void*/, [number, number, number]);\n}\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =

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util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n  castedInput =\n  cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n  inputId =\n  backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if\n (util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n  // dispose of the transposed\n  tensor.\n  backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n  // reshape\n  const newShape =\n  backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n }\n\n if (input.dtype\n !== 'float32') {\n  backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:\n KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: mean as { }\n  as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n */

```

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=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:\n number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n}\n\nfunction min(args: {backend:\n BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let\n  inputId = xId;\n  let input = x;\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n  permuteAxesAndTranspose(x, axis, backend);\n  if (inputWasTransposed) {\n    const transposedId =\n    backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We\n      will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n    }\n  }\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('min', axes,\n  inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape,\n  axes);\n  const reduceSize = util.sizeFromShape(reduceShape);\n  const out = backend.makeOutput(outShape,\n  input.dtype);\n  if (util.sizeFromShape(input.shape) !== 0) {\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n    wasmMin(inputId, CCppType[x.dtype], reduceSize, outId);\n  }\n\n  if\n  (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape = backend_util.expandShapeToKeepDim(out.shape,\n    originalAxes);\n    out.shape = newShape;\n  }\n\n  return out;\n}\n\nexport const minConfig: KernelConfig = {\n  kernelName: Min,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: min as { }\n  as\n  KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n */

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=====\n\n*\n\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const minimumConfig: KernelConfig =\n
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createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode { \n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\n\nfunction\n  setup(backend: BackendWasm) {\n    wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n      'number', // xId\n      'array', // x.shape\n      'number', // x.shape.length\n      'number', // x.dtype\n      'array', // pre-paddings\n      'array', // post-paddings\n      'number', // mode\n      'number', // outId\n    ]);\n\n    function\n      mirrorPad(args: {\n        inputs: MirrorPadInputs,\n        backend: BackendWasm,\n        attrs: MirrorPadAttrs\n      }) {\n        const { inputs: { x }, backend, attrs: { paddings, mode } } = args;\n        const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n        const xId = backend.dataIdMap.get(x.dataId).id;\n        const out = backend.makeOutput(outShape, x.dtype);\n        const outId = backend.dataIdMap.get(out.dataId).id;\n        const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n        const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n        const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n        const prePaddingsBytes =\n          new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n        const postPaddingsBytes =\n          new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n        wasmMirrorPad(\n          xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n          postPaddingsBytes, MirrorPaddingMode[mode], outId);\n        return out;\n      }\n\n    export const mirrorPadConfig: KernelConfig = {\n      kernelName: MirrorPad,\n      backendName: 'wasm',\n      kernelFunc: mirrorPad as { } as KernelFunc,\n      setupFunc: setup\n    };\n  }\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\n  createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { BackendWasm } from './backend_wasm';\n\n// Analogous to `struct Result` in\n`non_max_suppression_impl.h`\n\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the\n * shape equivalent to\n * `Result`\n */\n\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:\n  number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const\n  pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const\n  pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,\n  pValidOutputs};\n}\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n * the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
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=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,\n  NonMaxSuppressionV3Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from\n './backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number)\n=> number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n  NonMaxSuppressionV3,\n  'number', // Result*\n  [\n    'number', // boxesId\n    'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', // scoreThreshold\n  ]);\n}\n\nfunction kernelFunc(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV3Inputs,\n  attrs:\n  NonMaxSuppressionV3Attrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold,\n  maxOutputSize, scoreThreshold} = attrs;\n  const {boxes, scores} = inputs;\n  const boxesId =\n  backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n  const\n  resOffset =\n  wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n  const\n  {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n  parseResultStruct(backend, resOffset);\n  // Since we are not using scores for V3, we have to delete it from the heap.\n  backend.wasm._free(pSelectedScores);\n  backend.wasm._free(pValidOutputs);\n  const selectedIndicesTensor\n  =\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n  return\n  selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n  kernelName:\n  NonMaxSuppressionV3,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc as {\n  } as\n  KernelFunc,\n};\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
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*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV4,\n    'number', // Result*\n    [\n    'number', // boxesId\n
'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', //
scoreThreshold\n    'bool', // padToMaxOutputSize\n    ]);\n\n  function nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n  inputs: NonMaxSuppressionV4Inputs,\n  attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize } =\n      attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const
resOffset = wasmFunc(\n      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n      padToMaxOutputSize);\n\n    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using scores for V4, we have to delete it from the
heap.\n    backend.wasm._free(pSelectedScores);\n\n    const selectedIndicesTensor =\n      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n    const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n    return [selectedIndicesTensor,
validOutputsTensor];\n\n  }\n\n  export const nonMaxSuppressionV4Config: KernelConfig = {\n    kernelName:
NonMaxSuppressionV4,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n  };
\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n  number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n    'number', // boxesId\n
'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', //
scoreThreshold\n    'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n backend:
BackendWasm,\n  inputs: NonMaxSuppressionV5Inputs,\n  attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[]
{\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma }
=\n      attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n\n    const { pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n    backend.wasm._free(pValidOutputs);\n\n    const
selectedIndicesTensor =\n      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n    const
selectedScoresTensor =\n      backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n    return
[selectedIndicesTensor, selectedScoresTensor];\n\n  }\n\n  export const nonMaxSuppressionV5Config: KernelConfig =
{\n    kernelName: NonMaxSuppressionV5,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: kernelFunc
as { } as KernelFunc,\n  };
\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed

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=====  
*^nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';nimport {createBinaryKernelConfig} from  
 './binary_kernel';nconst supportsFullBroadcast = false;nexport const notEqualConfig: KernelConfig =n  
 createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');n", "/*n * @licensen * Copyright 2020  
 Google LLC. All Rights Reserved.n * Licensed under the Apache License, Version 2.0 (the "License");n * you  
 may not use this file except in compliance with the License.n * You may obtain a copy of the License atn *n *  
 http://www.apache.org/licenses/LICENSE-2.0n *n * Unless required by applicable law or agreed to in writing,  
 softwaren * distributed under the License is distributed on an "AS IS" BASIS,n * WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied.n * See the License for the specific language  
 governing permissions andn * limitations under the License.n *
```

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=====  
*^nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-  
 core';nimport {BackendWasm} from './backend_wasm';nlet wasmOneHot: (n indicesId: number, depth:  
 number, onValue: number, offValue: number, n outId: number) => void;nfunction setup(backend:  
 BackendWasm) {n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [n 'number', // indices_idn  
 'number', // depth,n 'number', // onValuen 'number', // offValuen 'number' // out_idn ]);n}nfunction  
 oneHot(n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {n const {inputs,  
 backend, attrs} = args;n const {indices} = inputs;n const {depth, onValue, offValue} = attrs;n const out =  
 backend.makeOutput([...indices.shape, depth], 'int32');n const outId = backend.dataIdMap.get(out.dataId).id;n  
 const indicesData = backend.dataIdMap.get(indices.dataId);n const indicesId = indicesData.id;n  
 wasmOneHot(indicesId, depth, onValue, offValue, outId);n return out;n}nexport const oneHotConfig:  
 KernelConfig = {n kernelName: OneHot,n backendName: 'wasm',n setupFunc: setup,n kernelFunc: oneHot as  
 {} as KernelFunc,n};n", "/*n * @licensen * Copyright 2020 Google LLC. All Rights Reserved.n * Licensed  
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 on an "AS IS" BASIS,n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
 implied.n * See the License for the specific language governing permissions andn * limitations under the  
 License.n *
```

```
=====  
*^nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';nimport  
 {BackendWasm} from './backend_wasm';nfunction onesLike(args: {inputs: OnesLikeInputs, backend:  
 BackendWasm}) {n const {inputs: {x}, backend} = args;n const out = backend.makeOutput(x.shape, x.dtype);n  
 const outVals = backend.typedArrayFromHeap(out);n outVals.fill(1);n return out;n}nexport const  
 onesLikeConfig: KernelConfig = {n kernelName: OnesLike,n backendName: 'wasm',n kernelFunc: onesLike as  
 {} as KernelFunc,n};n", "/*n * @licensen * Copyright 2020 Google LLC. All Rights Reserved.n * Licensed  
 under the Apache License, Version 2.0 (the "License");n * you may not use this file except in compliance with the  
 License.n * You may obtain a copy of the License atn *n * http://www.apache.org/licenses/LICENSE-2.0n *n *  
 Unless required by applicable law or agreed to in writing, softwaren * distributed under the License is distributed  
 on an "AS IS" BASIS,n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
 implied.n * See the License for the specific language governing permissions andn * limitations under the  
 License.n *
```

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=====
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';
\nimport {BackendWasm} from './backend_wasm';
\nimport {concat} from './Concat';
\nimport {expandDims} from './ExpandDims';
\n\nexport function pack(\n  args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):
\n  TensorInfo {\n    const {inputs, backend, attrs} = args;
\n    const {axis} = attrs;
\n\n    if (inputs.length === 1) {\n      return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});
\n    }\n\n    const shape = inputs[0].shape;
\n    const dtype = inputs[0].dtype;
\n\n    inputs.forEach(t => {\n      util.assertShapesMatch(\n        shape, t.shape,
\n        'All tensors passed to stack must have matching shapes');
\n      util.assert(\n        dtype === t.dtype,
\n        () => 'All tensors passed to stack must have matching dtypes');
\n    });
\n\n    const intermediateTensorInfos: TensorInfo[] = [];
\n    const expandedTensors = inputs.map(t => {\n      const expandedT =
\n        expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});
\n      intermediateTensorInfos.push(expandedT);
\n      return expandedT;
\n    });
\n\n    const result = concat({inputs: expandedTensors, backend, attrs: {axis}});
\n\n    intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));
\n\n    return result;
\n  }\n\nexport const packConfig: KernelConfig = {\n  kernelName: Pack,
\n  backendName: 'wasm',
\n  kernelFunc: pack as {} as KernelFunc\n};
\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';
\nimport {BackendWasm} from './backend_wasm';
\nimport {fill} from './Fill';
\nimport {CppType} from './types';
\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,
\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,
\n  constantValue: number, outId: number) => void;
\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n  ]);
\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;
\n\n  const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);
\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-circuit the computation, since x doesn't have value, only\n    // the shape is used to compute output shape to pad.\n    return fill({\n      backend,
\n      attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n    });
\n  }\n\n  const xId = backend.dataIdMap.get(x.dataId).id;
\n  const out = backend.makeOutput(outShape, x.dtype);
\n  const outTensorData = backend.dataIdMap.get(out.dataId);
\n  const outId = outTensorData.id;
\n\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);
\n\n  const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);
\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);
\n  const prePaddingsBytes = new Uint8Array(new Int32Array(prePaddingsFlat).buffer);
\n  const postPaddingsBytes = new Uint8Array(new Int32Array(postPaddingsFlat).buffer);
\n\n  wasmPadV2(xId, xShapeBytes, x.shape.length, CCppType[x.dtype], prePaddingsBytes, postPaddingsBytes, constantValue, outId);
\n  return out;
\n}\n\nexport const padV2Config: KernelConfig = {\n  kernelName: PadV2,
\n  backendName: 'wasm',
\n  kernelFunc: pad as {} as KernelFunc,
\n  setupFunc: setup\n};
\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n\n*\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,\n util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from\n './Cast';\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters:\n  number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear =\n  backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', //\n    oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', //\n    newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n\n  function\n  resizeBilinear(args: {\n    backend: BackendWasm,\n    inputs: ResizeBilinearInputs,\n    attrs: ResizeBilinearAttrs\n  }):\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n\n    const {images} = inputs;\n    const {alignCorners,\n    halfPixelCenters, size} = attrs;\n    const [newHeight, newWidth] = size;\n\n    const [batch, oldHeight, oldWidth,\n    numChannels] = images.shape;\n    const outShape = [batch, newHeight, newWidth, numChannels];\n\n    let xData =\n    backend.dataIdMap.get(images.dataId);\n    let castedData;\n    if (xData.dtype !== 'float32') {\n      castedData =\n      cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n      xData =\n      backend.dataIdMap.get(castedData.dataId);\n    }\n    const xId = xData.id;\n\n    const out =\n    backend.makeOutput(outShape, 'float32');\n    if (util.sizeFromShape(images.shape) === 0) {\n      return out;\n    }\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmResizeBilinear(\n      xId, batch, oldHeight,\n      oldWidth, numChannels, newHeight, newWidth,\n      alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n    if\n    (castedData !== null) {\n      backend.disposeData(castedData.dataId);\n    }\n\n    return out;\n  }\n\n  export const\n  resizeBilinearConfig: KernelConfig = {\n    kernelName: ResizeBilinear,\n    backendName: 'wasm',\n    setupFunc:\n    setup,\n    kernelFunc: resizeBilinear as { } as KernelFunc\n  };\n", "/**\n * @license\n * Copyright 2020 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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*\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {identity} from
'./Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array,
axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n
'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number'
// out_id\n  ]);\n}\n\nexport function reverse(\n  args: {inputs: ReverseInputs, backend: BackendWasm, attrs:
ReverseAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dims} =
attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return
identity({inputs: {x}, backend});\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const axesBytes =
new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
outId);\n\n    const reshaped =\n      reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\nexport const reverseConfig: KernelConfig = {\n
kernelName: Reverse,\n  backendName: 'wasm',\n  kernelFunc: reverse as {} as KernelFunc,\n  setupFunc:
setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *

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*\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight:
number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n
fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n    'number', // xId\n    'number', //
batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', //
radians\n    'number', // centerX\n    'number', // centerY\n    'array', // fillBytes\n    'number', // fillLength\n
'number', // outId\n  ]);\n}\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,\n
backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n\n  const out =
backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n  const [centerX, centerY] =\n    backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n  const fillIsBlack = fillValue === 0;\n  const fullOpacityValue = 255;\n\n  const fillValues =
typeof fillValue === 'number' ?\n    [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n    [...fillValue, fullOpacityValue];\n  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n    imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n    centerY,
fillBytes, fillValues.length, outId);\n  return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n  backendName: 'wasm',\n  kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
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=====  
* \nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from  
 './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *  
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 the specific language governing permissions and\n * limitations under the License.\n *  
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* \nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from  
 './unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *  
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 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
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 the specific language governing permissions and\n * limitations under the License.\n *  
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* \n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}  
 from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from  
 './types';\n\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank:  
 number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)  
 => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,  
 null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', //  
 sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs:  
 ScatterNdInputs, attrs: ScatterNdAttrs\n    }):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices,  
 updates} = inputs;\n    const {shape} = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if  
 (util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const {sliceRank, numUpdates, sliceSize, strides,  
 outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n\n    const indicesData =  
 backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    const updatesData =  
 backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n\n    const stridesBytes = new  
 Uint8Array(new Int32Array(strides).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n      sliceSize,  
 stridesBytes, outputSize, outId);\n\n    return out;\n  }\n\n  export const scatterNdConfig: KernelConfig = {\n    kernelName: ScatterNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: scatterNd as {} as  
 KernelFunc\n  };  
", "/*\n *  
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 implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
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*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,
offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n  'number', // conditionId\n  'number', // tId\n  'number', // eId\n
'number', // offset\n  'number', // outId\n  ]);\n\nfunction select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n  const {inputs, backend} = args;\n  const {condition, t, e} = inputs;\n\n  const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n  const tId = backend.dataIdMap.get(t.dataId).id;\n  const eId =
backend.dataIdMap.get(e.dataId).id;\n  const out = backend.makeOutput(t.shape, t.dtype);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const cRank = condition.shape.length;\n  const tRank =
t.shape.length;\n\n  const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n  1 :\n  util.sizeFromShape(t.shape.slice(1));\n\n  wasmSelect(conditionId, tId, eId, offset, outId);\n  return out;\n}\n\nexport
const selectConfig: KernelConfig = {\n  kernelName: Select,\n  backendName: 'wasm',\n  kernelFunc: select as { }
as KernelFunc,\n  setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
void */, ['number', 'number']);\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n
TensorInfo {\n  const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out
= backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  // Short-
circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId,
outId);\n  return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n  kernelName: 'Sigmoid',\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sigmoid as { } as KernelFunc\n};\n", "/*\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
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*\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", "/*\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
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*\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId:

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number, channels: number, batch: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n  'number', // xId\n  'number', // outId\n  'number', // channels\n  'number' // batch\n  ]);\n}\n\nfunction softmax(\n  args: {backend: BackendWasm,\n  inputs: SoftmaxInputs, attrs: SoftmaxAttrs});\n  TensorInfo {\n  const {backend, inputs: {logits}, attrs: {dim}} =\n  args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape,\n  logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channels = logits.shape[dim];\n  const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if\n  (util.sizeFromShape(out.shape) === 0) {\n  return out;\n  }\n\n  wasmFunc(xId, outId, channels, batch);\n  return\n  out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: softmax as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n  use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *  

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=====*\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,\n  SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from\n  '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from\n  './PadV2';\n\nimport {reshape} from './Reshape';\n\nimport {transpose} from './Transpose';\n\nfunction\n  spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:\n  SpaceToBatchNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,\n  paddings} = attrs;\n\n  const prod = util.sizeFromShape(blockShape);\n\n  const completePaddings: Array<[number,\n  number]> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<[number, number]>));\n\n  for (let i = 1 +\n  blockShape.length; i < x.shape.length; ++i) {\n  completePaddings.push([0, 0]);\n  }\n\n  const paddedX =\n  padV2Config.kernelFunc({\n  inputs: {x},\n  backend,\n  attrs: {paddings: completePaddings, constantValue:\n  0}\n  }) as TensorInfo;\n\n  const reshapedPaddedShape =\n  backend_util.getReshaped(paddedX.shape,\n  blockShape, prod, false);\n\n  const permutedReshapedPaddedPermutation =\n  backend_util.getPermuted(\n  reshapedPaddedShape.length, blockShape.length, false);\n\n  const flattenShape =\n  backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n  const reshapeInputs:\n  ReshapeInputs = {x: paddedX};\n  const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n  const\n  paddedXReshaped =\n  reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n  const transposeInputs:\n  TransposeInputs = {x: paddedXReshaped};\n  const transposeAttrs:\n  TransposeAttrs = {perm:\n  permutedReshapedPaddedPermutation};\n  const paddedXT =\n  transpose({inputs: transposeInputs, backend,\n  attrs: transposeAttrs});\n\n  const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n  const\n  resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n  const result = reshape(\n  {inputs:\n  resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n  backend.disposeData(paddedX.dataId);\n  backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n\n  return\n  result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n  License at\n * \n *  

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*\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\nimport {slice} from './Slice';\nexport function splitV(\n  args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n  const
{numOrSizeSplits, axis} = attrs;\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n  const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n
const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] =
s;\n    const xSlice =\n      slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n    begin[$axis] += s;\n
return xSlice;\n  });\n}\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName:
'wasm',\n  kernelFunc: splitV as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n", "/*\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig
=\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n
* http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\nfunction setup(backend:

```

```
BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n  'number', // x_id\n  'number', // alpha\n  'number', // dtype\n  'number', // out_id\n  ]);\n}\n\nfunction step(\n  args: {backend: BackendWasm, inputs: StepInputs, attrs: StepAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {alpha} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmStep(xId, alpha, CppDType[x.dtype], outId);\n    return out;\n  }\n}\n\nexport const stepConfig: KernelConfig = {\n  kernelName: Step,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: step as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array, xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n    'number', // xId\n    'array', // xStrides\n    'number', // xRank\n    'array', // beginBytes\n    'array', // endBytes\n    'array', // stridesBytes\n    'array', // outShapeBytes\n    'array', // outStridesBytes\n    'number', // outShapeLength\n    'number', // outId\n  ]);\n}\n\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n  inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n    newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n    sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n      newAxisMask, shrinkAxisMask);\n  let result;\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have rank at least 1, got: ${x.shape.length}`);\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n    // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out = backend.makeOutput(finalShapeSparse, 'float32');\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n    const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n    const endBytes = new Uint8Array(new Int32Array($end).buffer);\n    const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n    const outputShapeBytes =\n      new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n    const outStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmStridedSlice(\n      xId, xStridesBytes, x.shape.length, beginBytes, endBytes, stridesBytes,\n      outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n    result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n    backend.disposeData(out.dataId);\n  }\n}\n\nreturn result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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* \nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core'; \nimport {createBinaryKernelConfig} from  
'./binary_kernel'; \nconst supportsFullBroadcast = true; \nexport const subConfig: KernelConfig = \ncreateBinaryKernelConfig(Sub, supportsFullBroadcast); \n", "/* \n * @license \n * Copyright 2019 Google LLC. All  
Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the "License"); \n * you may not use this  
file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n *  
http://www.apache.org/licenses/LICENSE-2.0 \n * Unless required by applicable law or agreed to in writing,  
software \n * distributed under the License is distributed on an "AS IS" BASIS, \n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language  
governing permissions and \n * limitations under the License. \n *  
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=====  
* \n \nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from  
'@tensorflow/tfjs-core'; \nimport {BackendWasm} from './backend_wasm'; \nimport  
{permuteAxesAndTranspose} from './kernel_utils'; \nimport {CppType} from './types'; \n \nlet wasmSum: (xId:  
number, reduceSize: number, dtype: number, outId: number) => \n void; \n \nfunction setup(backend:  
BackendWasm): void { \n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [ \n 'number', // input_id \n  
'number', // reduce_size \n 'number', // dtype \n 'number', // out_id \n ]); \n \nfunction sum(args: {backend:  
BackendWasm, inputs: SumInputs, attrs: SumAttrs}): \n TensorInfo { \n const {backend, inputs, attrs} = args; \n  
const {axis, keepDims} = attrs; \n const {x} = inputs; \n const xId = backend.dataIdMap.get(x.dataId).id; \n let  
inputId = xId; \n let input = x; \n \n const {transposed, axes, originalAxes, inputWasTransposed} = \n  
permuteAxesAndTranspose(x, axis, backend); \n \n let reductionAxes = axes; \n if (inputWasTransposed) { \n const  
transposedId = backend.dataIdMap.get(transposed.dataId).id; \n if (transposedId !== xId) { \n // transpose was  
not a no-op. We will need to dispose of this \n // once we are done. \n input = transposed; \n inputId =  
transposedId; \n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length,  
input.shape.length); \n } \n } \n backend_util.assertAxesAreInnerMostDims(\n 'sum', reductionAxes,  
input.shape.length); \n const [outShape, reduceShape] = \n  
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes); \n const reduceSize =  
util.sizeFromShape(reduceShape); \n \n const out = backend.makeOutput(outShape, input.dtype); \n if  
(util.sizeFromShape(input.shape) !== 0) { \n const outId = backend.dataIdMap.get(out.dataId).id; \n  
wasmSum(inputId, reduceSize, CCppType[out.dtype], outId); \n } \n \n if (inputWasTransposed) { \n // dispose of  
the transposed tensor. \n backend.disposeData(transposed.dataId); \n } \n \n if (keepDims) { \n // reshape \n const  
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes); \n out.shape = newShape; \n } \n \n  
return out; \n } \n \nexport const sumConfig: KernelConfig = { \n kernelName: Sum, \n backendName: 'wasm', \n  
setupFunc: setup, \n kernelFunc: sum as { } as KernelFunc \n }; \n", "/* \n * @license \n * Copyright 2021 Google  
LLC. All Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the "License"); \n * you may not  
use this file except in compliance with the License. \n * You may obtain a copy of the License at \n * \n *  
http://www.apache.org/licenses/LICENSE-2.0 \n * Unless required by applicable law or agreed to in writing,  
software \n * distributed under the License is distributed on an "AS IS" BASIS, \n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for the specific language  
governing permissions and \n * limitations under the License. \n *  
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=====  
* \nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core'; \nimport {createUnaryKernelConfig} from  
'./unary_kernel'; \nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan); \n", "/* \n * @license \n *  
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```

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```
=====\n*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/**\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmTile: (\n  xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', // x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n  ]);\n}\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} = attrs;\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n    newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n  const out = backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n    xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n    CppDType[out.dtype], outId);\n  return out;\n}\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n", "/**\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmTopK: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted: boolean, outValuesId: number,\n  outIndicesId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n    'number', // xId\n    'array', // x_shape\n    'number', // x_shape.length\n    'number', // x_dtype\n    'number', // k\n    'bool', // sorted\n    'number', // outValuesId\n    'number', // outIndicesId\n  ]);\n}\nexport const topk: (\n  args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) => \n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n  const {k, sorted} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n  outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n
```

```

const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n
backend.makeOutput(outputShape, 'int32');\n
backend.dataIdMap.get(outIndices.dataId).id;\n\n
wasmTopK(\n      xId, xShapeBytes, x.shape.length,\n      CppDType[x.dtype], k, sorted,\n      outValuesId, outIndicesId);\n\n
return [outValues, outIndices];\n
};\n\n
export const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: topk as { } as KernelFunc,\n};\n\n
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=====\n
*/\n\n
import {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from '@tensorflow/tfjs-core';\n
import {BackendWasm} from '../backend_wasm';\n\n
let wasmTransform: (\n  imageId: number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth: number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n  stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number) => void;\n\n
function setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n    'number', // imageId\n    'number', // transformsId\n    'bool', // isBatchTransform\n    'number', // batch\n    'number', // outHeight\n    'number', // outWidth\n    'number', // numChannels\n    'number', // imageWidth\n    'number', // imageHeight\n    'array', // strides\n    'number', // stridesLength\n    'number', // interpolationModeId\n    'number', // fillModeId\n    'number', // fillValue\n    'number' // outId\n  ]);\n\n
function transform(\n  args: \n    {backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {image, transforms} = inputs;\n    const {interpolation, fillMode, fillValue, outputShape} = attrs;\n    const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n    const [outHeight, outWidth] =\n      outputShape != null ? outputShape : [imageHeight, imageWidth];\n    const outShape =\n      [batch, outHeight, outWidth,\n        numChannels] as [number, number, number, number];\n    const strides =\n      new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n    const out = backend.makeOutput(outShape, image.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const imageData = backend.dataIdMap.get(image.dataId);\n    const imageId = imageData.id;\n    const transformsData = backend.dataIdMap.get(transforms.dataId);\n    const transformsId = transformsData.id;\n\n    const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n    let fillModeId;\n    switch (fillMode) {\n      case 'constant':\n        fillModeId = 1;\n        break;\n      case 'reflect':\n        fillModeId = 2;\n        break;\n      case 'wrap':\n        fillModeId = 3;\n        break;\n      case 'nearest':\n        fillModeId = 4;\n        break;\n      default:\n        fillModeId = 1;\n        break;\n    }\n\n    wasmTransform(\n      imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n      outWidth, numChannels, imageWidth, imageHeight, strides,\n      image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n      outId);\n\n    return out;\n  }\n\n  export const transformConfig: KernelConfig = {\n    kernelName: Transform,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: transform as { } as KernelFunc\n  };
"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n
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*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { slice } from
'./Slice';\n\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n  const { inputs, backend, attrs } = args;\n  const { value } = inputs;\n  let { axis } = attrs;\n  if (axis <
0) {\n  axis += value.shape.length;\n  }\n\n  const numOutputs = value.shape[axis];\n  const rank =
value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;\n  i++) {\n  if (i !== axis) {\n  outShape[outIndex++] = value.shape[i];\n  }\n  }\n  const outs: TensorInfo[] = new
Array(numOutputs);\n  const begin = new Array(rank).fill(0);\n  const size = value.shape.slice();\n  size[axis] = 1;\n  for (let i = 0; i < outs.length; i++) {\n  begin[axis] = i;\n  outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },
backend});\n  }\n  return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n  }\n\nexport const
unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as { } as
KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend:
BackendWasm }) {\n  const { inputs: { x }, backend } = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n  }\n\nexport const
zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
as { } as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the
library. A modular build would replace\n// the contents of this file and import only the kernels that are
needed.\n\nimport { KernelConfig, registerKernel } from '@tensorflow/tfjs-core';\n\nimport { fusedMatMulConfig }
from './kernels/_FusedMatMul';\n\nimport { absConfig } from './kernels/Abs';\n\nimport { addConfig } from
'./kernels/Add';\n\nimport { addNConfig } from './kernels/AddN';\n\nimport { allConfig } from './kernels/All';\n\nimport
{ anyConfig } from './kernels/Any';\n\nimport { argMaxConfig } from './kernels/ArgMax';\n\nimport { avgPoolConfig }
from './kernels/AvgPool';\n\nimport { batchMatMulConfig } from './kernels/BatchMatMul';\n\nimport
{ batchToSpaceNDConfig } from './kernels/BatchToSpaceND';\n\nimport { castConfig } from './kernels/Cast';\n\nimport
{ ceilConfig } from './kernels/Ceil';\n\nimport { clipByValueConfig } from './kernels/ClipByValue';\n\nimport
{ concatConfig } from './kernels/Concat';\n\nimport { conv2DConfig } from './kernels/Conv2D';\n\nimport
{ conv2DBackpropInputConfig } from './kernels/Conv2DBackpropInput';\n\nimport { cosConfig } from
'./kernels/Cos';\n\nimport { coshConfig } from './kernels/Cosh';\n\nimport { cropAndResizeConfig } from
'./kernels/CropAndResize';\n\nimport { cumsumConfig } from './kernels/Cumsum';\n\nimport { depthToSpaceConfig }
from './kernels/DepthToSpace';\n\nimport { depthwiseConv2dNativeConfig } from
'./kernels/DepthwiseConv2dNative';\n\nimport { eluConfig } from './kernels/Elu';\n\nimport { equalConfig } from
'./kernels/Equal';\n\nimport { expConfig } from './kernels/Exp';\n\nimport { expandDimsConfig } from

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./kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
./kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
./kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
./kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
./kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
./kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
./kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
./kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
./kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
./kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
./kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
./kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  \n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n

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realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n
rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n
sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n
squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n
tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n
zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n", "/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n  'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n    0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n    2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n  ]));\n\n**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n  return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n  return WebAssembly.validate(new Uint8Array([\n    0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n    4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n  ]));\n } catch (e) {\n  return false;\n };\n\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = __filename;\n return
(function(WasmBackendModuleThreadedSimd) {\n  WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!=="undefined"?WasmBackendModuleThreadedSimd: {};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram= "./this.program";var quit_=function(status,toThrow){throw toThrow};var

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ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\\\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\\\"path\\\").
dirname(scriptDirectory)+\\\"^\"}else{scriptDirectory=__dirname+\\\"^\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\\\"fs\\\");if(!nodePath)nodePath=require(\\\"path\\\");filename=n
odePath[\\\"normalize\\\"](filename);return
nodeFS[\\\"readFileSync\\\"](filename,binary?null:\\\"utf8\\\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\\\"argv\\\"].length>1){thisProgram=process[\\\"argv\\\"][[1].replace(/\\\\\\\\\\\\g,\\\"^\\\")}arguments_=process[\\\"arg
v\\\"].slice(2);process[\\\"on\\\"](\\\"uncaughtException\\\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\\\"on\\\"](\\\"unhandledRejection\\\",abort);quit_=function(status){process[\\\"exit\\\"](status)};Module[\\\"insp
ect\\\"]=function(){return\\\"[Emscripten Module object]\\\"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\\\"worker_threads\\\")}catch(e){console.error(\\\"The
\\\"worker_threads\\\" module is not supported in this node.js build - perhaps a newer version is needed?\\\");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\\\"binary\\\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !== \"undefined\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\\\"blob:\\\")!=\"\"){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\\\"^\\")+1)}else{scriptDirectory=\\\"\"}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\\\"fs\\\");if(!nodePath)nodePath=require(\\\"path\\\");filename=n
odePath[\\\"normalize\\\"](filename);return
nodeFS[\\\"readFileSync\\\"](filename,binary?null:\\\"utf8\\\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\\\"GET\\\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\\\"GET\\\",url,false);xhr.responseType=\\\"arraybuffer\\\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\\\"GET\\\",url,true);xhr.responseType=\\\"arraybuffer\\\";xhr.onload=function(){if(xhr.status

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==200||xhr.status===0&&xhr.response){onload(xhr.response);return }onerror();xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance===\undefined\){global.performance=require(\perf_hooks\).performance}}var
out=Module[\print\]|console.log.bind(console);var err=Module[\printErr\]|console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\arguments\])arguments_=Module[\arguments\];if(Module[\thisProgram\])thisProgram=
Module[\thisProgram\];if(Module[\quit\])quit_=Module[\quit\];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\wasmBinary\])wasmBinary=Module[\wasmBinary\];var
noExitRuntime=Module[\noExitRuntime\]|true;if(typeof WebAssembly!=="object"){abort(\no native wasm
support detected)}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\Assertion failed: \'+text)}}function getCFunc(ident){var
func=Module[\_\' +ident];assert(func,\Cannot call unknown function \'+ident+, make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC=\\string\':function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\array\':function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\string\')return UTF8ToString(ret);if(returnType===\boolean\')return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\number\'});var
numericRet=returnType!=="string\';if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var

```



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len=0;for(var i=0;i<str.length;++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMem
ory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctor
s()});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]((ru
nDependencies))}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]((runDependencies))}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=nul
l}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new

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Error).stack);what+="\":err(what);ABORT=true;EXITSTATUS=1;what="\abort(\"+what+\")". Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="\data:application/octet-stream;base64,\";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="\file://\";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="\tfjs-backend-wasm-threaded-
simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the
wasm failed\"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\\"same-
origin\").then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
\"+wasmBinaryFile+\"\"})return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)}})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\\"wasm-
instantiate\").}))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\\"wasm-instantiate\");}function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\\"same-
origin\").then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\\"wasm streaming compile failed: \"+reason);err(\\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0})}};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA

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TCH:110,ENOCESI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function
_emsripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return
-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),_emsripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),_emsripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw"Atomic.notify returned an unexpected value
"+ret}Module["_emsripten_futex_wake"]=_emsripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! killThread() can only ever be
called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
killThread!";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cancelThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cancelThread!";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({"cmd":"cancel"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cleanupThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cleanupThread!";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);_emsripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emsripten_register_main_browser_thread_id(tb);initWorker:function(){},threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor

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e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emsc
ripten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\":"exit"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\":"cancelDone"})},terminateAllThreads:function(){for(var t in
PThread.threads){var
pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThre
ad.threads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){delete
PThread.threads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){var
thread=PThread.threads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"])}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\" to target pthread '+d["targetThread"]+'\", but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){__emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d["thread"])}else
if(cmd===\"killThread\"){killThread(d["thread"])}else
if(cmd===\"cancelThread\"){cancelThread(d["thread"])}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d["threadId"]+\"\":
\"+d["text"])}else if(cmd===\"printErr\"){err(\"Thread \"+d["threadId"]+\"\": \"+d["text"])}else
if(cmd===\"alert\"){alert(\"Thread \"+d["threadId"]+\"\": \"+d["text"])}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\"exitProcess\"){try{exit(d["returnCode"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent
an error! \"+e.filename+\":\"+e.lineno+\":
\"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:d
ata})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post

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Message({"cmd":"load","urlOrBlob":Module["mainScriptUrlOrBlob"]||_scriptDir,"wasmMemory":wasmMemory,"wasmModule":wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile("tfjs-backend-wasm-threaded-simd.worker.js");PThread.unusedWorkers.push(new Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var t=performance.now()+msecs;while(performance.now()<t){}};function establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop)}Module["establishStackSpace"]=establishStackSpace;function getNoExitRuntime(){return noExitRuntime}Module["getNoExitRuntime"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return wasmTable.get(ptr)(arg)}Module["invokeEntryPoint"]=invokeEntryPoint;function __assert_fail(condition,filename,line,func){abort("Assertion failed: "+UTF8ToString(condition)+" , at: "+[filename?UTF8ToString(filename):"unknown filename",line,func?UTF8ToString(func):"unknown function"])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var _emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var t=process["hrtime"]();return t[0]*1e3+t[1]/1e6}}else if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-Module["__performance_now_clock_drift"]}}else if(typeof dateNow!="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(1,1,func,arg)}function __emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessage({"cmd":"processQueuedMainThreadWork"})}else if(ENVIRONMENT_IS_PTHREAD){postMessage({"targetThread":targetThreadId,"cmd":"processThreadQueue"})}else{var pthread=PThread.threads[targetThreadId];var worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({"cmd":"processThreadQueue"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret=="timed-out")return-73;if(ret=="not-equal")return-6;if(ret=="ok")return 0;throw"Atomics.wait returned an unexpected value "+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return 0}}function _emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function _emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("os").cpus().length;return navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var

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args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){ var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);return
ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){ var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){ var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){ var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){ var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){ var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){ var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef

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erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return"";if(target==window)return"#window";
if(target==screen)return"#screen";return
target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return

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_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emsripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emsripten_set_current_thread_status(newStatus){}function
_emsripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension("\'ANGLE_instanced_arrays\");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ext["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcount){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension("\'OES_vertex_array_object\");if(ext){ctx["createVertexArray"]=function(){return
ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension("\'WEBGL_draw_buffers\");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffers
WEBGL"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension("\'WEBGL_multi_dra
w\'))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source="";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("\'webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===undefined||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contex
tHandle])GL.currentContext=null;if(typeof
JSEvents===object")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\'

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EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("\lose_context")<0&&ext.inde
xOf("\debug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)!="\"){name=name.slice(0,name.lastIndexOf("\["))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\["+j+"]";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["default","\low-power","\high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iow,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iow,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iow+i*8>>2];var len=GROWABLE_HEAP_I32()[iow+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var

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pthread=PThread.pthreads[threadParams.pthread_ptr]={ worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={`cmd\":"run\","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\undefined){err(\Current
environment does not support SharedArrayBuffer, pthreads are not available!)};return
6}if(!pthread_ptr){err(\pthread_create called with a null thread pointer!)};return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw\Canceled!}function
_emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread)};function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err(\pthread_join attempted on a null thread
pointer!)};return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()===thread){err(\PThread
"+thread+" is attempting to join to itself!)};return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()===thread){err(\Main thread
"+thread+" is attempting to join to itself!)};return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\pthread_join attempted on thread
"+thread+", which does not point to a valid thread, or does not exist anymore!)};return
ERRNO_CODES.ESRCH}var

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detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("Attempted to join thread
\"+thread+\", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thre
ad_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_w
rite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscript
en_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"

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asm\"][\["G\").apply(null,arguments)};var
_dispose=Module[\["_dispose\"]=function(){return(_dispose=Module[\["_dispose\"]=Module[\["asm\"][\["H\").apply(
null,arguments)}];var
_Abs=Module[\["_Abs\"]=function(){return(_Abs=Module[\["_Abs\"]=Module[\["asm\"][\["J\").apply(null,arguments
)}];var
_Add=Module[\["_Add\"]=function(){return(_Add=Module[\["_Add\"]=Module[\["asm\"][\["K\").apply(null,argumen
ts)}];var
_AddN=Module[\["_AddN\"]=function(){return(_AddN=Module[\["_AddN\"]=Module[\["asm\"][\["L\").apply(null,arg
uments)}];var
_All=Module[\["_All\"]=function(){return(_All=Module[\["_All\"]=Module[\["asm\"][\["M\").apply(null,arguments)}];
var
_Any=Module[\["_Any\"]=function(){return(_Any=Module[\["_Any\"]=Module[\["asm\"][\["N\").apply(null,argumen
ts)}];var
_ArgMax=Module[\["_ArgMax\"]=function(){return(_ArgMax=Module[\["_ArgMax\"]=Module[\["asm\"][\["O\").ap
ply(null,arguments)}];var
_AvgPool=Module[\["_AvgPool\"]=function(){return(_AvgPool=Module[\["_AvgPool\"]=Module[\["asm\"][\["P\").a
pply(null,arguments)}];var
_BatchMatMul=Module[\["_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\["_BatchMatMul\"]=Modu
le[\["asm\"][\["Q\").apply(null,arguments)}];var
_Ceil=Module[\["_Ceil\"]=function(){return(_Ceil=Module[\["_Ceil\"]=Module[\["asm\"][\["R\").apply(null,argument
s)}];var
_ClipByValue=Module[\["_ClipByValue\"]=function(){return(_ClipByValue=Module[\["_ClipByValue\"]=Module[\
["asm\"][\["S\").apply(null,arguments)}];var
_Conv2D=Module[\["_Conv2D\"]=function(){return(_Conv2D=Module[\["_Conv2D\"]=Module[\["asm\"][\["T\").app
ly(null,arguments)}];var
_Conv2DBackpropInput=Module[\["_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\["_Conv2DBackpropInput\"]=Module[\["asm\"][\["U\").apply(null,arguments)}];var
_Cos=Module[\["_Cos\"]=function(){return(_Cos=Module[\["_Cos\"]=Module[\["asm\"][\["V\").apply(null,arguments
)}];var
_Cosh=Module[\["_Cosh\"]=function(){return(_Cosh=Module[\["_Cosh\"]=Module[\["asm\"][\["W\").apply(null,argu
ments)}];var
_CropAndResize=Module[\["_CropAndResize\"]=function(){return(_CropAndResize=Module[\["_CropAndResize\"]=
Module[\["asm\"][\["X\").apply(null,arguments)}];var
_Cumsum=Module[\["_Cumsum\"]=function(){return(_Cumsum=Module[\["_Cumsum\"]=Module[\["asm\"][\["Y\").a
pply(null,arguments)}];var
_DepthToSpace=Module[\["_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\["_DepthToSpace\"]=M
odule[\["asm\"][\["Z\").apply(null,arguments)}];var
_DepthwiseConv2dNative=Module[\["_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=M
odule[\["_DepthwiseConv2dNative\"]=Module[\["asm\"][\["_\").apply(null,arguments)}];var
_Elu=Module[\["_Elu\"]=function(){return(_Elu=Module[\["_Elu\"]=Module[\["asm\"][\["$\").apply(null,arguments)}]
};var
_Equal=Module[\["_Equal\"]=function(){return(_Equal=Module[\["_Equal\"]=Module[\["asm\"][\["aa\").apply(null,ar
guments)}];var
_Exp=Module[\["_Exp\"]=function(){return(_Exp=Module[\["_Exp\"]=Module[\["asm\"][\["ba\").apply(null,argument
s)}];var
_FlipLeftRight=Module[\["_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\["_FlipLeftRight\"]=Modul
e[\["asm\"][\["ca\").apply(null,arguments)}];var
_Floor=Module[\["_Floor\"]=function(){return(_Floor=Module[\["_Floor\"]=Module[\["asm\"][\["da\").apply(null,arg

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uments));var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][["ea"]]).
apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchN
orm"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Mod
ule["asm"][["ga"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=M
odule["_FusedDepthwiseConv2D"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][["ia"]]).apply(nul
l,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][["ja"
]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][["ka"]]).apply(
null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module[
"asm"][["la"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][
["ma"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][["na"]]).apply(null,argume
nts)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][["o
a"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][["pa"]]).apply(null,argument
s)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm
"][["qa"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][["ra"]]).apply(null,argume
nts)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["sa"]]).
apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["ta"
]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["ua"]]).apply(null,ar
guments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["va"]]).apply(null,argumen
ts)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["wa
"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["x
a"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ya"
]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["za"]]).apply(null,argumen
ts)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Mod
ule["_NonMaxSuppressionV3"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Mod

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ule["_NonMaxSuppressionV4"]=Module["_asm"]["_Ba"].apply(null,arguments);var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Mod
ule["_NonMaxSuppressionV5"]=Module["_asm"]["_Ca"]).apply(null,arguments);var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["_asm"]["_Da\
"]).apply(null,arguments);var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["_asm"]["_Ea"]).appl
y(null,arguments);var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["_asm"]["_Fa"]).apply(nu
ll,arguments);var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["_asm"]["_Ga"]).apply(null,argume
nts);var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["_asm"]["_Ha"]).apply(nu
ll,arguments);var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["_asm"]["_Ia"]).apply(nu
ll,arguments);var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["_asm"]["_Ja"]).app
ly(null,arguments);var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["_asm"]["_Ka"]).apply(nu
ll,arguments);var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["_asm"]["_La"]).apply(nu
ll,arguments);var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear\
"]=Module["_asm"]["_Ma"]).apply(null,arguments);var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["_asm"]["_Na"]).app
ly(null,arguments);var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["_asm"]["_Oa"]).apply(null,arguments);var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["_asm"]["_Pa"]).apply(nu
ll,arguments);var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["_asm"]["_Qa"]).apply(nu
ll,arguments);var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["_asm"]["_Ra
"]).apply(null,arguments);var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["_asm"]["_Sa\
"]).apply(null,arguments);var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["_asm"]["_Ta"]).app
ly(null,arguments);var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["_asm"]["_Ua"]).apply(null,arguments)
};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["_asm"]["_Va"]).a
pply(null,arguments);var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["_asm"]["_Wa"]).apply(nu
ll,arguments);var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["_asm"]["_Xa"]).apply(n
ull,arguments);var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["_asm"]["_Ya"]).apply(null,arguments);var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["_asm"]["_Za"]).apply(nu
ll,arguments);var

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nts));var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"]["_a"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["$a"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["ab"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["bb"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["cb"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["db"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["eb"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["fb"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["gb"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"]["hb"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["ib"]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["jb"]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"]["kb"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["asm"]["lb"]).apply(null,arguments)};var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["asm"]["mb"]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"]["nb"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=function(){return(_emscripten_main_thread_process_queued_calls=Module["asm"]["ob"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=function(){return(_emscripten_current_thread_process_queued_calls=Module["asm"]["pb"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=function(){return(_emscripten_register_main_browser_thread_id=Module["asm"]["qb"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_emscripten_main_browser_thread_id=Module["asm"]["rb"]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__emscripten_do_dispatch_to_thread=Module["asm"]["sb"]).apply(null,arguments)};var

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_emsripten_sync_run_in_main_thread_4=Module["_emsripten_sync_run_in_main_thread_4"]=function(){return
(_emsripten_sync_run_in_main_thread_4=Module["_emsripten_sync_run_in_main_thread_4"]=Module["asm\
"]["tb\"]).apply(null,arguments)};var
_emsripten_run_in_main_runtime_thread_js=Module["_emsripten_run_in_main_runtime_thread_js"]=function(
){return(_emsripten_run_in_main_runtime_thread_js=Module["_emsripten_run_in_main_runtime_thread_js"]=
Module["asm\"]["ub\"]).apply(null,arguments)};var
__emsripten_call_on_thread=Module["__emsripten_call_on_thread"]=function(){return(__emsripten_call_on_t
hread=Module["__emsripten_call_on_thread"]=Module["asm\"]["vb\"]).apply(null,arguments)};var
_emsripten_tls_init=Module["_emsripten_tls_init"]=function(){return(_emsripten_tls_init=Module["_emscript
en_tls_init"]=Module["asm\"]["wb\"]).apply(null,arguments)};var
__emsripten_thread_init=Module["__emsripten_thread_init"]=function(){return(__emsripten_thread_init=Mod
ule["__emsripten_thread_init"]=Module["asm\"]["xb\"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm\"]["yb\"]).a
pply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm\
"]["zb\"]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm\"]["Ab\
"]).apply(null,arguments)};var
_emsripten_stack_set_limits=Module["_emsripten_stack_set_limits"]=function(){return(_emsripten_stack_set
limits=Module["_emsripten_stack_set_limits"]=Module["asm\"]["Bb\"]).apply(null,arguments)};var
_memalign=Module["_memalign"]=function(){return(_memalign=Module["_memalign"]=Module["asm\"]["Cb\
"]).apply(null,arguments)};var
__emsripten_allow_main_runtime_queued_calls=Module["__emsripten_allow_main_runtime_queued_calls"]=1
0512;var
__emsripten_main_thread_futex=Module["__emsripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap
;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module
["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit(\"+status+\")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"]("")},1);doRun(),1)}else{doRun()}}Module["run"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({"cmd":"exitProcess","returnCode":status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module["onExit"])Module["onExit"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n)(\n\n\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports["WasmBackendModuleThreadedSimd"] =

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WasmBackendModuleThreadedSimd;\n", "\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{ };var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){ readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={ };var key;for(key in
Module){if(Module.hasOwnProperty(key)){ moduleOverrides[key]=Module[key] }}var arguments_=[];var
thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\\\\\g,\"/\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"} }else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\") {read_=function shell_read(f) {return read(f) }}readBinary=function readBinary(f) {var
data;if(typeof readbuffer===\"function\") {return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data };if(typeof
scriptArgs!=\"undefined\") {arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\") {arguments_=arguments}if(typeof
quit===\"function\") {quit_=function(status){quit(status) }}if(typeof print!=\"undefined\") {if(typeof
console===\"undefined\")console={ };console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print } }else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src;if(_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"} } {read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response) }}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return }onerror()};xhr.onerror=onerror;xhr.send(null)}

```

```

}setWindowTitle=function(title){ document.title=title }else{ }var
out=Module[\'"print"\"]||console.log.bind(console);var err=Module[\'"printErr"\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module[\'"arguments"\"])arguments_=Module[\'"arguments"\"];if(Module[\'"thisProgram"\"])thisProgram=
Module[\'"thisProgram"\"];if(Module[\'"quit"\"])quit_=Module[\'"quit"\"];var
wasmBinary;if(Module[\'"wasmBinary"\"])wasmBinary=Module[\'"wasmBinary"\"];var
noExitRuntime=Module[\'"noExitRuntime"\"]||true;if(typeof WebAssembly!=="object"){ abort(\'"no native wasm
support detected"\')}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){ abort(\'"Assertion failed: \' +text)\'} }function getCFunc(ident){ var
func=Module[\'"_' +ident\"];assert(func,\'"Cannot call unknown function \' +ident+"", make sure it is exported\");return
func }function ccall(ident,returnType,argTypes,args,opts){ var toC={\'"string\":function(str){ var
ret=0;if(str!==null&&str!==undefined&&str!==0){ var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\'"array\":function(arr){ var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret } };function
convertReturnValue(ret){ if(returnType===\'"string"\")return UTF8ToString(ret);if(returnType===\'"boolean"\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){ for(var
i=0;i<args.length;i++){ var
converter=toC[argTypes[i]];if(converter){ if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{ cArgs[i
]=args[i] } }var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){ argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){ return type===\'"number"\'});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){ return getCFunc(ident)}return
function(){ return ccall(ident,returnType,argTypes,arguments,opts) } }var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder(\'"utf8"\"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){ var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){ return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{ var
str=\'";while(idx<endPtr){ var u0=heap[idx++];if(!(u0&128)){ str+=String.fromCharCode(u0);continue }var
u1=heap[idx++]&63;if((u0&224)==192){ str+=String.fromCharCode((u0&31)<<6|u1);continue }var
u2=heap[idx++]&63;if((u0&240)==224){ u0=(u0&15)<<12|u1<<6|u2}else{ u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63 }if(u0<65536){ str+=String.fromCharCode(u0)}else{ var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023) } }return str}function
UTF8ToString(ptr,maxBytesToRead){ return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\'"\' }function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){ if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){ var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){ if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){ if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){ if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{ if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63} }heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){ return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){ if(x%multiple>0){ x+=multiple-x%multiple}return x }var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function

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updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"]((runDependencies))}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]((runDependencies))}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file==wasmBinaryFile&&wasmBinaryFile){return new
Uint8Array(wasmBinaryFile)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinaryFile&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function

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```

receiveInstantiatedSource(output){receiveInstance(output["instance\"])function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err("\failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\function\&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\function\"){return fetch(wasmBinaryFile,{credentials:"same-
origin\").then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("\wasm streaming compile failed: \"+reason);err("\falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm\"){try{var
exports=Module["instantiateWasm\"](info,receiveInstance);return exports}catch(e){err("\Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\function\){callback(Module);continue}var func=callback.func;if(typeof
func===\number\){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg
)}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iow,iovcnt,pnum){var num=0;for(var
i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _pthread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return

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16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84: {if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1 } }setErrNo(28);return-1 }var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).app
ly(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"
asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments
)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,argu
ments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]

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=Module["asm"]["G"].apply(null,arguments);var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["H"].a
pply(null,arguments));var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=M
odule["asm"]["I"].apply(null,arguments));var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=M
odule["_DepthwiseConv2dNative"]=Module["asm"]["J"].apply(null,arguments));var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"].apply(null,arguments)
);var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"].apply(null,arg
uments));var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"].apply(null,argument
s));var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Modu
le["asm"]["N"].apply(null,arguments));var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"].apply(null,argu
ments));var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"].
apply(null,arguments));var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchN
orm"]=Module["asm"]["Q"].apply(null,arguments));var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Modu
le["asm"]["R"].apply(null,arguments));var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=M
odule["_FusedDepthwiseConv2D"]=Module["asm"]["S"].apply(null,arguments));var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["T"].apply(null
,arguments));var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["U"
]).apply(null,arguments);var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["V"].apply(
null,arguments));var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module[
"asm"]["W"].apply(null,arguments));var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["
X"].apply(null,arguments));var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["Y"].apply(null,argume
nts));var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["
Z"].apply(null,arguments));var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["_"].apply(null,arguments
));var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm
"]["$"].apply(null,arguments));var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["aa"].apply(null,argume
nts));var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["ba"].
apply(null,arguments));var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["c

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a").apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["da"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["ea"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]["fa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"]["ga"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"]["ha"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"]["ia"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"]["ja"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"]["ka"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"]["la"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"]["ma"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"]["na"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"]["oa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"]["pa"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"]["qa"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"]["ra"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"]["sa"]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"]["ta"]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"]["ua"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"]["va"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"]["wa"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"]["xa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"]["ya"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"]["za"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"]["Aa"]

```

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\").apply(null,arguments));var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"]["Ba"]).
.apply(null,arguments));var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"]["Ca"]).ap
ply(null,arguments));var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"]["Da"]).apply(null,arguments)
};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Ea"]).ap
ply(null,arguments));var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Fa"]).apply(null,argumen
ts));var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Ga"]).apply(n
ull,arguments));var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"]["Ha"]).apply(null,arguments));var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Ia"]).apply(null,argume
nts));var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"]["Ja"]).apply(null,arguments));var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["Ka"]).apply(null,argument
s));var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["La"]).apply(null,argumen
ts));var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["Ma"]).apply(null,argumen
ts));var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["Na"]).apply(null,argu
ments));var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["Oa"]).apply(null,argumen
ts));var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["Pa"]).apply(null,ar
guments));var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["Qa"
]).apply(null,arguments));var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["Ra"
]).apply(null,arguments));var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"]["Sa"]).apply(null,arguments));var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["Ta"]).apply(nu
ll,arguments));var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["Ua"]).apply(null,argument
s));var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"]["Va"]).apply(null,arguments));var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"]["Wa"
]).apply(null,arguments));var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
]["Xa"]).apply(null,arguments));var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"]["Ya"

```



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this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n  const {memoryOffset,\n  dtype, shape, stringBytes} =\n    this.dataIdMap.get(dataId);\n  if (dtype === 'string') {\n    return stringBytes;\n  }\n  const bytes = this.wasm.HEAPU8.slice(\n    memoryOffset,\n    memoryOffset +\n    util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n  return typedArrayFromBuffer(bytes.buffer, dtype);\n}\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n disposeData(dataId: DataId, force = false): boolean {\n  if (this.dataIdMap.has(dataId)) {\n    const data =\n      this.dataIdMap.get(dataId);\n    data.refCount--;\n    if (!force && data.refCount > 0) {\n      return false;\n    }\n\n    this.wasm._free(data.memoryOffset);\n    this.wasm.tfjs.disposeData(data.id);\n    this.dataIdMap.delete(dataId);\n  }\n  return true;\n}\n\n /** Return refCount of a `TensorData`. */\n refCount(dataId: DataId): number {\n  if (this.dataIdMap.has(dataId)) {\n    const tensorData =\n      this.dataIdMap.get(dataId);\n    return tensorData.refCount;\n  }\n  return 0;\n}\n\n incRef(dataId: DataId) {\n  const data = this.dataIdMap.get(dataId);\n  if (data != null) {\n    data.refCount++;\n  }\n}\n\n floatPrecision():\n 32 {\n  return 32;\n}\n\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n getMemoryOffset(dataId: DataId): number {\n  return this.dataIdMap.get(dataId).memoryOffset;\n}\n\n dispose() {\n  this.wasm.tfjs.dispose();\n  if ('PThread' in this.wasm) {\n    this.wasm.PThread.terminateAllThreads();\n  }\n  this.wasm = null;\n}\n\n memory() {\n  return {unreliable:\n  false};\n}\n\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n makeOutput(shape:\n  number[], dtype: DataType, memoryOffset?: number):\n  TensorInfo {\n  let dataId: {};\n  if (memoryOffset\n  == null) {\n    dataId = this.write(null /* values */, shape, dtype);\n  } else {\n    const id =\n      this.dataIdNextNumber++;\n    dataId = {id};\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,\n    refCount: 1});\n    const size = util.sizeFromShape(shape);\n    this.wasm.tfjs.registerTensor(id, size,\n    memoryOffset);\n  }\n  return {dataId, shape, dtype};\n}\n\n typedArrayFromHeap({shape, dtype, dataId}:\n  TensorInfo):\n  backend_util.TypedArray {\n  const buffer = this.wasm.HEAPU8.buffer;\n  const\n  {memoryOffset} = this.dataIdMap.get(dataId);\n  const size = util.sizeFromShape(shape);\n  switch (dtype) {\n  case 'float32':\n    return new Float32Array(buffer, memoryOffset, size);\n  case 'int32':\n    return new\n    Int32Array(buffer, memoryOffset, size);\n  case 'bool':\n    return new Uint8Array(buffer, memoryOffset,\n    size);\n  default:\n    throw new Error(`Unknown dtype ${dtype}`);\n  }\n}\n\n\nfunction\n  createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n  // minprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n    util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n      if (!response['ok']) {\n        imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n      response.arrayBuffer().then(binary => {\n        WebAssembly.instantiate(binary, imports).then(output => {\n          callback(output.instance, output.module);\n        });\n      });\n    });\n    return {};\n  };\n}\n\n /**\n * Returns the path of the WASM binary.\n * @param\n  simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM binaries.\n */\n function getPathToWasmBinary(\n  simdSupported: boolean, threadsSupported: boolean,\n  wasmModuleFolder: string) {\n  if (wasmPath != null) {\n    // If wasmPath is defined, the user has supplied a full path to\n    // the vanilla .wasm binary.\n    return\n    wasmPath;\n  }\n  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported &&\n  threadsSupported) {\n    path = 'tfjs-backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path =\n    'tfjs-backend-wasm-simd.wasm';\n  }\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n      return\n      wasmFileMap[path];\n    }\n  }\n  return wasmModuleFolder + path;\n}\n\n /**\n * Initializes the wasm module and creates the js <--> wasm bridge.\n * NOTE: We wrap the wasm module in a object with property\n * 'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in\n  Chrome 76).\n */\n export async function init(): Promise<{wasm: BackendWasmModule}> {\n  const\n  [simdSupported, threadsSupported] = await Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n  ]

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env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n ]);\n\n return new Promise((resolve, reject) =>
{\n  const factoryConfig: WasmFactoryConfig = {};\n\n  /**\n   * This function overrides the Emscripten
module locateFile utility.\n   * @param path The relative path to the file that needs to be loaded.\n   * @param
prefix The path to the main JavaScript file's directory.\n   */\n  factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n    const response = wasmWorkerContents;\n    const blob = new
Blob([response], {type: 'application/javascript'});\n    return URL.createObjectURL(blob);\n  }\n\n  if
(path.endsWith('.wasm')) {\n    return getPathToWasmBinary(\n      simdSupported as boolean,
threadsSupported as boolean,\n      wasmPathPrefix != null ? wasmPathPrefix : prefix);\n  }\n  return prefix
+ path;\n  };\n\n  // Use the instantiateWasm override when system fetch is not available.\n  // Reference:\n  //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n    factoryConfig.instantiateWasm =\n
createInstantiateWasmFunc(getPathToWasmBinary(\n      simdSupported as boolean, threadsSupported as
boolean,\n      wasmPathPrefix != null ? wasmPathPrefix : ''));\n  }\n\n  let initialized = false;\n
factoryConfig.onAbort = () => {\n    if (initialized) {\n      // Emscripten already called console.warn so no need to
double log.\n      return;\n    }\n    if (initAborted) {\n      // Emscripten calls `onAbort` twice, resulting in double
error\n      // messages.\n      return;\n    }\n    initAborted = true;\n    const rejectMsg =\n      'Make sure the
server can serve the `.wasm` file relative to the '+\n      'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n
reject({message: rejectMsg});\n  };\n\n  let wasm: Promise<BackendWasmModule>;\n  // If `wasmPath` has
been defined we must initialize the vanilla module.\n  if (threadsSupported && simdSupported && wasmPath ==
null) {\n    factoryConfig.mainScriptUrlOrBlob = new Blob(\n      [var WasmBackendModuleThreadedSimd = `
+\n      wasmFactoryThreadedSimd.toString()),\n      {type: 'text/javascript'});\n    wasm =
wasmFactoryThreadedSimd(factoryConfig);\n  } else {\n    // The wasmFactory works for both vanilla and SIMD
binaries.\n    wasm = wasmFactory(factoryConfig);\n  }\n\n  // The WASM module has been successfully
created by the factory.\n  // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n    initialized = true;\n    initAborted = false;\n\n    const voidReturnType: string =
null;\n    // Using the tfjs namespace to avoid conflict with emscripten's API.\n    module.tfjs = {\n      init:
module.cwrap('init', null, []),\n      initWithThreadsCount:\n        module.cwrap('init_with_threads_count', null,
[number']),\n      getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n      registerTensor:
module.cwrap(\n        'register_tensor', null,\n        [\n          'number', // id\n          'number', // size\n
'number', // memoryOffset\n        ]),\n      disposeData: module.cwrap('dispose_data', voidReturnType,
[number']),\n      dispose: module.cwrap('dispose', voidReturnType, []),\n    };\n\n    resolve({wasm: module});\n
  });\n  });\n\nfunction typedArrayFromBuffer(\n  buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n  switch (dtype) {\n    case 'float32':\n      return new Float32Array(buffer);\n    case
'int32':\n      return new Int32Array(buffer);\n    case 'bool':\n      return new Uint8Array(buffer);\n    default:\n
throw new Error(`Unknown dtype ${dtype}`);\n  }\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n  'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ntype
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n */\n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and'+\n    ' ' will be removed in a future release.);\n  if
(initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call '+\n

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`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`;\n }
\n wasmPath = path;\n customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n *   'tfjs-backend-wasm.wasm': 'renamed.wasm',\n *   'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *   'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *```\n *\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * - Note that this prefix will be used to load each binary (vanilla,\n * - SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * - full paths specifying the locations of those binaries. This is useful\n * - if your WASM binaries are not all located in the same directory, or if your\n * - WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n * ^\n * export function setWasmPaths(\n *   prefixOrFileMap: string|{\n *     [key in WasmBinaryName]?: string\n *   },\n *   usePlatformFetch = false): void {\n *     if (initAborted) {\n *       throw new Error(\n *         'The WASM backend was already initialized. Make sure you call '\n *         `setWasmPaths()` before you call `tf.setBackend()` or '\n *         `tf.ready()`);\n *     }\n *     if (typeof prefixOrFileMap === 'string') {\n *       wasmPathPrefix = prefixOrFileMap;\n *     } else {\n *       wasmFileMap = prefixOrFileMap;\n *       const missingPaths =\n *         wasmBinaryNames.filter(name => wasmFileMap[name] === null);\n *       if (missingPaths.length > 0) {\n *         throw new Error(\n *           `There were no entries found for the following binaries: ` +\n *           `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n *           `map providing a path for each binary, or with a string indicating ` +\n *           `the directory where all the binaries can be found.`);\n *       }\n *     }\n *     customFetch = usePlatformFetch;\n *   }\n * }\n\n\n/**\n * Used in unit tests.\n * ^\n * export function resetWasmPath(): void {\n *   wasmPath = null;\n *   wasmPathPrefix = null;\n *   wasmFileMap = {};\n *   customFetch = false;\n *   initAborted = false;\n * }\n\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n * ^\n * export function setThreadsCount(numThreads: number) {\n *   threadsCount = numThreads;\n * }\n\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is initialized.\n * ^\n * export function getThreadsCount(): number {\n *   if (actualThreadsCount === -1) {\n *     throw new Error('WASM backend not initialized.);\n *   }\n *   return actualThreadsCount;\n * }\n\n",export const\nwasmWorkerContents = `var Module={};function threadPrintErr(){var\n  text=Array.prototype.slice.call(arguments).join("\\n");console.error(text)}function threadAlert(){var\n  text=Array.prototype.slice.call(arguments).join("\\n");\n  postMessage({cmd:"alert",text:text,threadId:Module["_pthread_self"]()})}\n  err=threadPrintErr;this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){var\n  instance=new\n  WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);\n  return instance.exports};function\n  moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd===\\"load\\"){Module["wasmModule"]=e.data.wasmModule;Module["wasmMemory"]=e.data.wasmMemory;Module["buffer"]=Module["wasmMemory"].buffer;Module["ENVIRONMENT_IS_PTHREAD"]=true;if(typeof\n  e.data.urlOrBlob===\\"string\\"){importScripts(e.data.urlOrBlob)}else{var\n  objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}\n  WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else\n  if(e.data.cmd===\\"objectTransfer\\"){Module["PThread"].receiveObjectTransfer(e.data)}else\n  if(e.data.cmd===\\"run\\"){Module["__performance_now_clock_drift"]=performance.now()-\n  e.data.time;Module["__emscripten_thread_init"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var\n  top=e.data.stackBase+e.data.stackSize;Module["establishStackSpace"](top,max);Module["_emscripten_tls_init"](\n  );Module["PThread"].receiveObjectTransfer(e.data);Module["PThread"].setThreadStatus(Module["_pthread_self"](),1);try{var\n  result=Module["invokeEntryPoint"](e.data.start_routine,e.data.arg);if(!Module["getNoExitRuntime"]())Module[\n
```

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"PThread\").threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\").threadCancel()}else
if(ex!==\"unwind!\"){if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){else{Module[\"PThread\").threadExit(ex.status)}}el
se{Module[\"PThread\").threadExit(-2);throw ex}}}}else
if(e.data.cmd===\"cancel!\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\").threadCancel()} }else
if(e.data.target===\"setimmediate!\"){ }else
if(e.data.cmd===\"processThreadQueue!\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()){}}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string!\"){self={location:{href:__filename}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8!\");function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined!\"){performance={now:function(){return Date.now()}}}};\"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License!\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm,
init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\n\nexport {version as version_wasm} from './version';\n\nconst
WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new
BackendWasm(wasm);\n}, WASM_PRIORITY);\n,\"/** @license See the LICENSE file. *\n\n// This code is
auto-generated, do not modify this file!\n\nconst version = '3.11.0';\n\nexport
{version};\n\n,\"names\":[\"CppType\", \"FusableActivation\", \"wasmFusedMatMul\", \"fusedMatMulConfig\", \"kernelNa
me\", \"_FusedMatMul\", \"backendName\", \"setupFunc\", \"backend\", \"wasm\", \"cwrap\", \"kernelFunc\", \"args\", \"inputs\", \"attrs\"
, \"a\", \"b\", \"bias\", \"preluActivationWeights\", \"dtype\", \"Error\", \"transposeA\", \"transposeB\", \"activation\", \"leakyreluAlpha\",
\"aId\", \"dataIdMap\", \"get\", \"dataId\", \"id\", \"bId\", \"biasId\", \"biasData\", \"shape\", \"length\", \"preluActivationWeightsId\", \"fuse
dActivation\", \"leftDim\", \"rightDim\", \"batchDim\", \"out\", \"makeOutput\", \"outId\", \"aShapeBytes\", \"Uint8Array\", \"Int32Arr
ay\", \"buffer\", \"bShapeBytes\", \"createUnaryKernelConfig\", \"outType\", \"wasmFunc\", \"x\", \"xId\", \"util\", \"sizeFromShape\", \"
absConfig\", \"Abs\", \"createBinaryKernelConfig\", \"supportsFullBroadcast\", \"outputType\", \"newShape\", \"backend_util\", \"
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Found in path(s):

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No license file was found, but licenses were detected in source scan.

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License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util }  
from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from  
 './types';\nimport { transpose } from './Transpose';\nlet wasmCumsum: (xId: number, exclusive: number, reverse:  
number,\n      finalDim: number, outId: number, dtype: CppDType) => void;\nfunction setup(backend:  
BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n    'number', // x_id\n    'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n    'number' //  
dtype\n  ]);\n}\nexport function cumsum(\n  args: {inputs: CumsumInputs, backend: BackendWasm, attrs:  
CumsumAttrs});\nTensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis,  
exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n  util.assert(x.dtype === 'float32' || x.dtype ===  
'int32',\n    () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n  // permute required axis  
to inner most axis\n  const permutation = backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if (permutation !== null) {\n    permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n  const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n  const permutedOut =  
backend.makeOutput(permutedX.shape, permutedX.dtype);\n  const finalDim = permutedX.shape[permutedAxis];\n  const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId =  
backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,  
finalDim,\n    permutedOutId, CppDType[x.dtype]);\n  // transpose data back if permuted\n  let out =  
permutedOut;\n  if (permutation !== null) {\n    const undoPermutation =  
backend_util.getUndoAxesPermutation(permutation);\n    out = transpose(\n      {inputs: {x: permutedOut}, attrs:  
{perm: undoPermutation}, backend});\n  }  
backend.disposeData(permutedX.dataId);\n  backend.disposeData(permutedOut.dataId);\n  return out;\n}\nexport const cumsumConfig: KernelConfig =  
{\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as {} as  
KernelFunc\n};\n"]}
```

Found in path(s):

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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

=====
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from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from
'./kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:
BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] =
slice_util.parseSliceParams(x, begin, size);\n\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,
size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const
xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinuous)
{\n    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n    if (x.dtype === 'string') {\n
outData.stringBytes =\n      (xVals as Uint8Array[])\n        .slice(flatOffset, flatOffset +
util.sizeFromShape(size_));\n    } else {\n      const outVals = backend.typedArrayFromHeap(out);\n
outVals.set(\n      (xVals as TypedArray)\n        .subarray(flatOffset, flatOffset +
util.sizeFromShape(size_));\n    }\n\n    return out;\n  }\n\n  if (x.dtype === 'string') {\n    const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n    outData.stringBytes = res as Uint8Array[];\n    return
out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2)
{\n    slice2d(\n      xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n      size_ as
[number, number]);\n  } else if (rank === 3) {\n    slice3d(\n      xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n      begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4)
{\n    slice4d(\n      xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n      begin_ as [number,
number, number, number],\n      size_ as [number, number, number, number]);\n  } else {\n    const res =\n    sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n    outVals.set(res);\n  }\n\n  return
out;\n}\n\nfunction slice2d(\n  xVals: backend_util.TypedArray, xStride: number,\n  outVals:
backend_util.TypedArray, begin: [number, number],\n  size: [number, number]): void {\n  let outOffset = 0;\n
const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI;
i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n  xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n  outVals: backend_util.TypedArray, begin: [number, number, number],\n  size:
[number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n
const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i <
endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n  xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n  xStride3:
number, outVals: backend_util.TypedArray,\n  begin: [number, number, number, number],\n  size: [number,
number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n
const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK
+ size[2];\n  const beginL = begin[3];\n\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++)
{\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +

```

```
beginL;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n    outOffset += size[3];\n}\n}\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as { } as KernelFunc,\n};\n"]}
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the  
License for the specific language governing permissions and\n * limitations under the License.\n *  
=====\n\n*/\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}  
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from  
 './types';\n\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank:  
number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)  
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,  
null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', //  
sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs:  
ScatterNdInputs, attrs: ScatterNdAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices,  
updates} = inputs;\n    const {shape} = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if  
(util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const {sliceRank, numUpdates, sliceSize, strides,
```



```
outputSize } =\n  scatter_util.calculateShapes(updates, indices, shape);\n\n  const indicesData =
  backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const updatesData =
  backend.dataIdMap.get(updates.dataId);\n  const updatesId = updatesData.id;\n\n  const stridesBytes = new
  Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmScatterNd(\n    indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n    sliceSize, stridesBytes, outputSize, outId);\n\n  return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n  kernelName: ScatterNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: scatterNd as {} as
  KernelFunc\n};\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ScatterNd.js.map

No license file was found, but licenses were detected in source scan.

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  License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
  agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *
  =====\n
  *\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
  './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n"]}
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Add.js.map

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```
=====\n *\n We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';
```

```

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from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
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{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  \n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n
  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n
  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n
  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n
  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n
  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n
  zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n\n]]}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/register_all_kernels.js.map

```

No license file was found, but licenses were detected in source scan.

```

{"version":3,"file":"Floor.js","sourceRoot":"","sources":["../../src/kernels/Floor.ts"],"names":[],"mappings":"AAAA;
;;;;;;;;;;GAeG;AACH,OAAO,EAAC,KAAK,EAAe,MAAM,uBAAuB,CAAC;AAE1D,OAAO,EAAC,uBAAuB,EA
AAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,WAAW,GAAiB,uBAAuB,CAAC,KAAK,CAAC,
CAAC","sourcesContent":["/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed

```

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```
=====
*\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n}}
```

Found in path(s):

`/opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Floor.js.map`

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```
{"version":3,"file":"All.js","sourceRoot":"","sources":["../../src/kernels/All.ts"],"names":[],"mappings":"AAAA;:::;GAG;AAEH,OAEO,EAAC,GAAG,EAAB,YAAY,EAAC,IAAI,EAAC,MAAM,uBAAB,CAAC;AAIzH,OAEO,EAAC,uBAAB,EAAC,MAAM,gBAAG,CAAC;AAEvD,IAAI,OAaE,CAAC;AAEtE,SAAS,KAAK,CAAC,OAaB;IACjC,OAEO,GAAG,OAEO,CAAC,IAAI,CAAC,KAAK,CAAC,GAAG,EAAE,IAAI,CAAC,QAAQ,EAAE,CAAC,wBAAB,CAAC,CAAC,CAAC;AAC/E,CAAC;AAED,SAAS,GAAG,CAAC,IAAG;IAE3E,MAAM,EAAC,OAEO,EAAE,MAAM,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,IAAI,EAAE,QAAQ,EAAC,GAAG,KAAK,CAAC;IAC/B,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;IACnB,MAAM,GAAG,GAAG,OAEO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/C,IAAI,OAEO,GAAG,GAAG,CAAC;IACIB,IAAI,KAAK,GAAG,CAAC,CAAC;IAEd,MAAM,EAAC,UAUU,EAAE,IAAI,EAAE,YAAY,EAAE,kBAAB,EAAC,GACtD,uBAAB,CAAC,CAAC,EAAE,IAAI,EAAE,OAEO,CAAC,CAAC;IAE9C,IAAI,kBAAB,EAAE;QACtB,MAAM,YAAY,GAAG,OAEO,CAAC,SAAS,CAAC,GAAG,CAAC,UAUU,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACjE,KAAK,GAAG,UAUU,CAAC;QACnB,OAEO,GAAG,YAAY,CAAC;KACxB;IAED,MAAM,SAAS,GAAG,KAAK,CAAC,KAAK,CAAC,MAAM,CAAC;IACrC,YAAY,CAAC,OBAA0B,CAAC,KAAK,EAAE,IAAI,EAAE,SAAS,CAAC,CAAC;IACHe,MAAM,CAAC,QAAQ,EAAE,WAAW,CAAC,GACzB,YAAY,CAAC,yBAAY,CAAC,KAAK,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC;IAC9D,MAAM,UAUU,GAAG,IAAI,CAAC,aAAa,CAAC,WAAW,CAAC,CAAC;IAEnD,MAAM,GAAG,GAAG,OAEO,CAAC,UAUU,CAAC,QAAQ,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;IACID,IAAI,IAAI,CAAC,aAAa,CAAC,KAAK,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;QACzC,MAAM,KAAK,GAAG,OAEO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACnD,OAEO,CAAC,OAEO,EAAE,UAUU,EAAE,KAAK,CAAC,CAAC;KACrC;IAED,IAAI,kBAAB,EAAE;QACtB,oCAAoC;QACpC,OAEO,CAAC,WAAW,CAAC,UAUU,CAAC,MAAM,CAAC,CAAC;KACxC;IAED,IAAI,QAAQ,EAAE;QACZ,UAUU;QACV,MAAM,QAAQ,GAAG,YAAY,CAAC,oBAaB,CAAC,GAAG,CAAC,KAAK,EAAE,YAAY,CAAC,CAAC;QAC5E,GAAG,CAAC,KAAK,GAAG,QAAQ,CAAC;KACtB;IAED,OAEO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,SAAS,GAAiB;IACrC,UAUU,EAAE,GAAG;IACf,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KAAK;IACb,UAUU,EAAE,GAAuB;CACpC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n * =====\n */\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
```


KAC5D;IAED,MAAM,GAAG,GAAG,OOAO,CAAC,UAAU,CAAC,QAAQ,CAAC,QAAQ,EAAE,SAAS,CAAC,CAAC;IAC7D,MAAM,KAAC,GAAG,OOAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IACnD,UAAU,CACN,GAAG,EAAE,CAAC,CAAC,KAAC,CAAC,CAAC,CAAC,EAAE,C AAC,CAAC,KAAC,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,KAAC,CAAC,CAAC,CAAC,EAAE,QAAQ,EA AE,YAA Y,EAC/D,WAAW,EAAE,MAAM,EAAE,QAAQ,EAAE,SAAS,EAAE,OOAO,EAAE,SAAS,EAC5D,cA Ac,EAAE,aAAa,EAAE,YAA Y,EAAE,WAAW,EAAE,aAAa,EACvE,cAAc,EAAE,KAAC,CAAC,CAAC;IAC3B, OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,YAA Y,GAAiB;IACxC,UAAU,EAAE,MAA M;IACIB,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KAAC;IACb,UAAU,EAAE,MAA0B;CACvC,CAAC", "s ourceContent":["/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

=====
*\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n  xId:
  number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number,
  filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad:
  number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number,
  inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend:
  BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\n  function conv2d(\n    args: {inputs: Conv2DInputs, backend:
    BackendWasm, attrs: Conv2DAttrs}) {\n    const {inputs, attrs, backend} = args;\n    const {x, filter} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n    const $dataFormat =
    backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, false,
      $dataFormat);\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const
    padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom =
    convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight =
    convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight =
    convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =
    convInfo.inChannels;\n    const outputChannels = convInfo.outChannels;\n    const isSamePad = convInfo.padInfo.type
    === 'SAME' ? 1 : 0;\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n        `wasm backend
        Conv2D does not support dataFormat: ` +\n        `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n    }\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n    const outId =
    backend.dataIdMap.get(out.dataId).id;\n    wasmConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId,
      filterHeight,\n      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight,
      dilationWidth, strideHeight, strideWidth, inputChannels,\n      outputChannels, outId);\n    return out;\n  }\n\n  export
  const conv2DConfig: KernelConfig = {\n    kernelName: Conv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: conv2d as { } as KernelFunc\n  };
}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Conv2D.js.map

No license file was found, but licenses were detected in source scan.

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{"version":3,"file":"tf-backend-wasm.node.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernels/Identity.ts","../src/kernels/Transpose.ts","../src/kernels/kernel_utils.ts","../src/kernels/All.ts","../src/kernels/Any.ts","../src/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/kernels/Ceil.ts","../src/kernels/ClipByValue.ts","../src/kernels/Concat.ts","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_utils.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/Range.ts","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Softmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts","../src/kernels/Sum.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/Tile.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-simd.worker.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../src/version.ts","../src/base.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n * =====\n *\n * This enum must align with the enum defined in cc/backend.h.\n * export enum CppDType {\n *   float32 = 0,\n *   int32 = 1,\n *   bool = 2,\n *   string = 3,\n *   complex64 = 4\n * }\n *\n * Must match enum in cc/fusable_activations.h.\n * export\n * enum FusableActivation {\n *   linear = 0,\n *   relu = 1,\n *   relu6 = 2,\n *   prelu = 3,\n *   leakyrelu = 4,\n *   sigmoid = 5,\n *   elu = 6\n * }\n */\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n * License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
```


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```
=====  
*  
\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from  
'@tensorflow/tfjs-core';  
\nimport { BackendWasm } from './backend_wasm';  
\nimport { FusableActivation } from  
'./types';  
\nlet wasmFusedMatMul: (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,  
bShape: Uint8Array, bShapeSize: number, transposeA: boolean, transposeB: boolean, activation: number,  
biasId: number, preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>  
void;  
\nfunction setup(backend: BackendWasm) {  
  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,  
  null /* void */, [ \n 'number', // a_id \n 'array', // a_shape \n 'number', // a_shape.length \n 'number', // b_id \n  
'array', // b_shape \n 'number', // b_shape.length \n 'number', // transpose_a \n 'number', // transpose_b \n  
'number', // activation \n 'number', // biasId \n 'number', // preluActivationWeightsId \n 'number', //  
leakyreluAlpha \n 'number' // out_id \n ]);  
\n  function fusedBatchMatMul(args: { inputs:  
    _FusedMatMulInputs, \n    backend: BackendWasm, \n    attrs: _FusedMatMulAttrs \n }) {  
    const { inputs, backend,  
    attrs } = args;  
    const { a, b, bias, preluActivationWeights } = inputs;  
    if (a.dtype !== 'float32' || b.dtype !==  
'float32') {  
      throw new Error(`_FusedMatMul for non non-float32 tensors not yet supported.`);  
    }  
    const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;  
    const aId =  
    backend.dataIdMap.get(a.dataId).id;  
    const bId = backend.dataIdMap.get(b.dataId).id;  
    let biasId = 0;  
    if (bias != null) {  
      const biasData = backend.dataIdMap.get(bias.dataId);  
      if (biasData.shape.length !== 1) {  
        throw new Error(`_FusedMatMul only supports rank-1 bias but got ` +  
          `rank  
          ${biasData.shape.length}.`);  
      }  
      biasId = biasData.id;  
    }  
    const preluActivationWeightsId =  
    preluActivationWeights == null ? 0 :  
    backend.dataIdMap.get(preluActivationWeights.dataId).id;  
    const  
    fusedActivation = \n    FusableActivation[activation as { } as keyof typeof FusableActivation];  
    if  
    (fusedActivation == null) {  
      throw new Error(` ${activation} activation not yet supported for  
      FusedConv2D ` +  
      `in the wasm backend.`);  
    }  
    const leftDim = transposeA ? a.shape[2] : a.shape[1];  
    const rightDim = transposeB ? b.shape[1] : b.shape[2];  
    const batchDim = a.shape[0];  
    const out =  
    backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);  
    const outId =  
    backend.dataIdMap.get(out.dataId).id;  
    const aShapeBytes = new Uint8Array(new  
    Int32Array(a.shape).buffer);  
    const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);  
    wasmFusedMatMul(\n    aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length, \n    transposeA,  
    transposeB, fusedActivation, biasId, preluActivationWeightsId, \n    leakyreluAlpha || 0, outId);  
    return  
    out; \n }  
\n  export const fusedMatMulConfig: KernelConfig = {  
    kernelName: _FusedMatMul, \n    backendName:  
    'wasm', \n    setupFunc: setup, \n    kernelFunc: fusedBatchMatMul as { } as KernelFunc \n }; \n }  
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* limitations under the License.  
*  
=====  
*  
\nimport { DataType, KernelConfig, TensorInfo, UnaryInputs, util } from '@tensorflow/tfjs-core';  
\nimport  
{ BackendWasm } from './backend_wasm';  
\nimport { CppDType } from './types';  
\nexport function  
createUnaryKernelConfig(\n  kernelName: string, outType?: DataType): KernelConfig {  
  let wasmFunc: (xId:  
    number, dtype: number, outId: number) => void;  
  function setupFunc(backend: BackendWasm): void {  
    wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [ \n 'number', // x_id \n 'number', // dtype \n  
'number', // out_id \n ]);  
  }  
  function kernelFunc(args: { backend: BackendWasm, inputs: UnaryInputs }): \n
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TensorInfo {\n  const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(x.shape, outType || x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n  wasmFunc(xId, CppDType[x.dtype], outId);\n  return out;\n }\n\n return {kernelName, backendName: 'wasm',\n  setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n  compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *

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*/\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n  License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n  agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n  the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nexport\n  function createBinaryKernelConfig(\n    kernelName: string, supportsFullBroadcast: boolean,\n    dtype?:\n    DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n    number,\n    bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n    void;\n\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /*\n    void */, [\n    'number', // a_id,\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // dtype\n    'number' // out_id\n    ]);\n  }\n\n  function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n    TensorInfo {\n    const {backend,\n    inputs} = args;\n    const {a, b} = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId =\n    backend.dataIdMap.get(b.dataId).id;\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape =\n    backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape,\n    outputType);\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return\n    out;\n    }\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes =\n    new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const kernelFunc = () => wasmFunc(\n    aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n    CppDType[a.dtype], outId);\n    // Currently only some float operations support full broadcast.\n    if\n    (supportsFullBroadcast && a.dtype === 'float32') {\n    kernelFunc();\n    return out;\n    }\n    const\n    aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims =\n    backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n    v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA &&\n    loopsOverAllOfB) {\n    kernelFunc();\n    return out;\n    } else {\n    throw new Error(\n    `Broadcasting\n    along outer dims is not yet ` +\n    `supported for ${a.dtype} ${kernelName}.`);\n    }\n  }\n\n  return\n  {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n  use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet wasmFunc:\n  (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n    void;\n\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n    'array', // input_ids\n    'number', // input_ids.length\n    'number', // dtype\n    'number', // out_id\n  ]);\n\n  function addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n    const {inputs, backend} = args;\n    const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(out.shape) === 0) {\n      return out;\n    }\n\n    const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n    const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmFunc(inputIdsBytes, inputIds.length, CCppType[out.dtype], outId);\n    return out;\n  }\n\n  export const addNConfig: KernelConfig = {\n    kernelName: AddN,\n    backendName: 'wasm',\n    setupFunc,\n    kernelFunc: addn as {} as KernelFunc,\n  }; \n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n  TensorInfo {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const inVals = backend.toArrayFromHeap(x);\n  const outVals = backend.toArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const identityConfig: KernelConfig = {\n  kernelName: Identity,\n  backendName: 'wasm',\n  kernelFunc: identity as {} as KernelFunc,\n}; \n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from
```

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'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {identity} from
 './Identity';\n\nimport {CppType} from './types';\n\nlet wasmTranspose: (\n  xId: number, xShape: Uint8Array,
  xShapeLength: number, dtype: CppDType,\n  outId: number, perm: Uint8Array, permLength: number) =>
  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTranspose = backend.wasm.cwrap(Transpose, null /*
  void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // dtype\n    'number', // outId\n    'array', // perm\n    'number', // perm.length\n  ]);\n\n  export function transpose(\n    args:\n      {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs});\n    TensorInfo {\n      const {inputs,
      backend, attrs} = args;\n      // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n      // better
      due to simpler memory access pattern.\n      const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,
      attrs.perm);\n\n      let permIsNoOp = true;\n      for (let i = 0; i < perm.length; i++) {\n        if (perm[i] !== i) {\n
          permIsNoOp = false;\n        }\n      }\n      const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n      const x = {\n
        dataId: inputs.x.dataId,\n        shape: reducedShape,\n        dtype: inputs.x.dtype\n      };\n\n      if (permIsNoOp) {\n        const
        cloned = identity({inputs, backend});\n        cloned.shape = outShape;\n        return cloned;\n      }\n\n      const out =
        backend.makeOutput(outShape, x.dtype);\n      const xId = backend.dataIdMap.get(x.dataId).id;\n      const outId =
        backend.dataIdMap.get(out.dataId).id;\n      const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n      const
        xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n      wasmTranspose(\n        xId,
        xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n        perm.length);\n      return
        out;\n    }\n\n    function computeOutShape(inShape: number[], perm: number[]): number[] {\n      const outShape = new
      Array(inShape.length);\n      for (let i = 0; i < outShape.length; i++) {\n        outShape[i] = inShape[perm[i]];\n      }\n
      return outShape;\n    }\n\n    function removeOneSizeDims(\n      shape: number[], perm: number[]): [number[], number[]]
      {\n      const newShape: number[] = [];\n      const newPerm: number[] = [];\n      for (let i = 0; i < shape.length; ++i) {\n        if
        (shape[i] !== 1) {\n          newShape.push(shape[i]);\n        }\n        if (shape[perm[i]] !== 1) {\n
          newPerm.push(perm[i]);\n        }\n      }\n      for (let i = 0; i < newPerm.length; ++i) {\n        let minValIdx = -1;\n        for (let j =
        0; j < newPerm.length; ++j) {\n          if (newPerm[j] >= i &&\n            (minValIdx === -1 || newPerm[minValIdx] >
            newPerm[j])) {\n            minValIdx = j;\n          }\n        }\n        newPerm[minValIdx] = i;\n      }\n      return [newShape,
        newPerm];\n    }\n\n    export const transposeConfig: KernelConfig = {\n      kernelName: Transpose,\n      backendName:
        'wasm',\n      kernelFunc: transpose as {} as KernelFunc,\n      setupFunc: setup,\n    };
  }\n\n  /**\n   * @license\n   * Copyright
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  OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language
  governing permissions and\n   * limitations under the License.\n   *
  =====\n\n  *\n\n  import {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\n  import {BackendWasm} from
  './backend_wasm';\n  import {transpose} from './Transpose';\n\n  /**\n   * Compute permutation axes and do a transpose
  if necessary.\n   * \n   * Used by reduction ops.\n   * \n   * @param x input TensorInfo\n   * \n   * @param axis
  reduction axes\n   * \n   * @param backend wasm backend instance\n   */\n  export function permuteAxesAndTranspose(\n    x: TensorInfo,
    axis: number|number[], backend: BackendWasm): {\n      transposed: TensorInfo|null,\n      axes: number[],\n      originalAxes:
      number[],\n      inputWasTransposed: boolean\n    } {\n    const xShape = x.shape;\n    const xRank =
      x.shape.length;\n\n    const originalAxes = util.parseAxisParam(axis, xShape);\n    let axes = originalAxes;\n    const
      permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n    let xTransposed = null;\n    let
      inputWasTransposed = false;\n    if (permutedAxes !== null) {\n      const newShape: number[] = new Array(xRank);\n      for
      (let i = 0; i < newShape.length; i++) {\n        newShape[i] = xShape[permutedAxes[i]];\n      }\n      axes =
        backend_util.getInnerMostAxes(axes.length, xRank);\n      xTransposed =\n        transpose({inputs: {x}, attrs: {perm:
        permutedAxes}, backend});\n\n      const xId = backend.dataIdMap.get(x.dataId).id;\n      const transposedId =
        backend.dataIdMap.get(xTransposed.dataId).id;\n      if (transposedId !== xId) {\n        inputWasTransposed = true;\n
      }\n    }\n\n    return {\n      transposed: xTransposed,\n      originalAxes,\n      axes,\n      inputWasTransposed\n    };
  }\n\n  /**\n   * @license\n   *

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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport  
{ permuteAxesAndTranspose } from './kernel_utils';\nlet wasmAll: (xId: number, reduceSize: number, outId:  
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null  
/*void*/, [number, number, number]);\n}\n\nfunction all(args: { backend: BackendWasm, inputs: AllInputs, attrs:  
AllAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x }  
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const  
{ transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if  
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =  
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =  
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if  
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =  
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return  
out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc:  
setup,\n  kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights  
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file  
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport  
{ permuteAxesAndTranspose } from './kernel_utils';\nlet wasmAny: (xId: number, reduceSize: number, outId:  
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,  
null /*void*/, [number, number, number]);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs,  
attrs: AnyAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const  
{ transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis,  
backend);\n\n  if  
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =  
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =  
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if  
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAny(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
```

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backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: any as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { permuteAxesAndTranspose } from
'/kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize:
number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n
'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n ]);\n\nfunction argmax(\n args:
{inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n
const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose
was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =
transposedId;\n }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out =
backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize =
util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId,
CppType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n // dispose of the
transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const
argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as {}
as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*\n\nimport { AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D } from
 '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmAvgPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n
'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n
'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n ]);\n\nfunction
avgPool(\n args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs,
backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const

```

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{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n
`wasm backend does not support dataFormat: ` +\n    `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n
}\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n    `was backend
only supports average pooling with dilation = [1, 1], ` +\n    `got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n    outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc\n};\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n  args: {inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} =
inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape =
util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n    xSize === util.sizeFromShape($shape),\n    () =>
`new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n    `shape must have the same number of
elements.`);\n\n // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n
return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n
kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as { } as KernelFunc\n};\n"/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
'/Reshape';\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n}\n\nfunction batchMatMul(args: {\n  inputs: BatchMatMulInputs,\n  backend:
BackendWasm,\n  attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n
const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n
`BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const

```


HggPSAwO1xuXG4gICAgICBmb3IgKGxldCByb3cgPSAwOyByb3cgPCBpbmB1dC5zaGFwZVswXTsgKytyb3cp
IHtcbiAgICAgICAgY29uc3QgcmVzSWR4ID0gcm93ICogb3V0U2hhcGVbMV0gKyBjb2xPZmZzZXQ7XG4gICA
gICAgIGZvciAobGV0IGNvbCA9IDA7IGNvbCA8IGlucHV0LnNoYXB1WzFdOyArK2NvbCkge1xuICAgICAgIC
AgIG91dFZhbHNbcmVzSWR4ICsgY29sXSA9IGRIY29kZWREYXRhW3RlZjZHRgK107XG4gICAgICAgIH1cbiA
gICAgIH1cb1xuICAgICAgY29sT2Zmc2V0ICs9IGlucHV0LnNoYXB1WzFdO1xuICAgIH0pO1xuICB9XG5cbiAgc
mV0dXJuIG91dFZhbHM7XG59XG4iXX0=","/*\n * @license\n * Copyright 2020 Google LLC. All Rights
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n*\nimport { util } from '@tensorflow/tfjs-core';\nexport function rangeImpl(start, stop, step, dtype) {\n  const\n  sameStartStop = start === stop;\n  const increasingRangeNegativeStep = start < stop && step < 0;\n  const\n  decreasingRangePositiveStep = stop < start && step > 1;\n  if (sameStartStop || increasingRangeNegativeStep ||\n  decreasingRangePositiveStep) {\n    return util.makeZerosTypedArray(0, dtype);\n  }\n  const numElements\n  = Math.abs(Math.ceil((stop - start) / step));\n  const values = util.makeZerosTypedArray(numElements, dtype);\n  if (stop < start && step === 1) {\n    // Auto adjust the step's sign if it hasn't been set\n    // (or was set to 1)\n    step = -1;\n  }\n  values[0] = start;\n  for (let i = 1; i < values.length; i++) {\n    values[i] = values[i - 1] +\n  step;\n  }\n  return values;\n}\n\n#
```

sourceMappingURL=data:application/json;base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiaU9uIj09L2VfaW1wbC50cyIsIn
VudXJjZVJvY29uc3QgcmVzSWR4ID0gcm93ICogb3V0U2hhcGVbMV0gKyBjb2xPZmZzZXQ7XG4gICAgICBmb3IgKGxldCByb3cgPSAwOyByb3cgPCBpbmB1dC5zaGFwZVswXTsgKytyb3cpIHtcbiAgICAgICAgY29uc3QgcmVzSWR4ID0gcm93ICogb3V0U2hhcGVbMV0gKyBjb2xPZmZzZXQ7XG4gICAgICAgIGZvciAobGV0IGNvbCA9IDA7IGNvbCA8IGlucHV0LnNoYXB1WzFdOyArK2NvbCkge1xuICAgICAgICAgIG91dFZhbHNbcmVzSWR4ICsgY29sXSA9IGRIY29kZWREYXRhW3RlZjZHRgK107XG4gICAgICAgIH1cbiAggICAgIH1cb1xuICAgICAgY29sT2Zmc2V0ICs9IGlucHV0LnNoYXB1WzFdO1xuICAgIH0pO1xuICB9XG5cbiAgcmV0dXJuIG91dFZhbHM7XG59XG4iXX0=","/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *


```

xStrides = util.computeStrides(x.shape);\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinuous)
{\n const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n if (x.dtype === 'string') {\n
outData.stringBytes =\n (xVals as Uint8Array[])\n .slice(flatOffset, flatOffset +
util.sizeFromShape(size_));\n } else {\n const outVals = backend.typedArrayFromHeap(out);\n
outVals.set(\n (xVals as TypedArray)\n .subarray(flatOffset, flatOffset +
util.sizeFromShape(size_));\n }\n\n return out;\n }\n\n if (x.dtype === 'string') {\n const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n outData.stringBytes = res as Uint8Array[];\n return
out;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2)
{\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as
[number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)
{\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number,
number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return
out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:
backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n
const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI;
i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:
[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK
+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)
{\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n
}\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n
kernelFunc: slice as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{reshape} from './Reshape';\n\nimport {slice} from './Slice';\n\nimport {transpose} from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,
crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped =
backend_util.getReshaped(x.shape, blockShape, prod);\n\n const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n\n const reshapedPermuted =\n

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backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n  transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n  {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n const result = slice({\n  inputs: {x: xTransposedReshaped},\n  backend,\n  attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n
backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return
result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n", "/**\n * @license\n *
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'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm});\n  TensorInfo {\n    const {inputs:
{x}, attrs: {dtype}, backend} = args;\n    const out = backend.makeOutput(x.shape, dtype);\n    const inVals =
backend.typedArrayFromHeap(x);\n    const outVals = backend.typedArrayFromHeap(out);\n    outVals.set(inVals);\n
return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc,\n};\n", "/**\n * @license\n *
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:
number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =
backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number', // x_id\n    'number', // min\n    'number', //
max\n    'number' // out_id\n  ]);\n\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend:
BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n
const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =
backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId,

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clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n  kernelName: ClipByValue,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: clip as {} as\n  KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from\n './kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\nexport function\n concat(\n  args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n    const {inputs, backend}\n    = args;\n    const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n    let outShape =\n    backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n    // Keep only non-empty tensors (ignore tensors\n    with 0 in their shape).\n    const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n    if ($inputs.length ===\n    1) {\n      return identity({inputs: {x: $inputs[0]}, backend});\n    }\n    const out = backend.makeOutput(outShape,\n    inputs[0].dtype);\n    if (util.sizeFromShape(outShape) === 0) {\n      return out;\n    }\n    const shapes =\n    $inputs.map(t => t.shape);\n    backend_util.assertParamsConsistent(shapes, axis);\n    if ($inputs[0].dtype ===\n    'string') {\n      // Any concat of n-dimensional tensors across any axis can be reduced to\n      // a concatenation of two-\n      dimensional tensors across the axis 1 by first\n      // partitioning the axes of the original tensors into those less than\n      // axis to be concatenated and the rest. Then reshape the tensors\n      // into a two-dimensional tensor by\n      collapsing these two sets of axes and\n      // concatenate the resulting matrices across the axis 1, finally reshaping\n      // the result to have the proper shape.\n      const inputs2D = $inputs.map(t => {\n        const innerSize =\n        util.sizeFromShape(t.shape.slice(axis));\n        const shape = [-1, innerSize];\n        return reshape({inputs: {x: t},\n        backend, attrs: {shape}});\n      });\n      const inputsValShapes = inputs2D.map(t => {\n        return {vals:\n        backend.readSync(t.dataId), shape: t.shape};\n      });\n      // Concat 2d tensors along axis=1.\n      outShape =\n      backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n      const simplyConcat =\n      inputs2D[0].shape[0] === 1;\n      const outVals = concatImplCPU(\n        inputsValShapes, outShape,\n        inputs[0].dtype,\n        simplyConcat) as string[];\n      const finalOutShape =\n      backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n      out.shape = finalOutShape;\n      const\n      outData = backend.dataIdMap.get(out.dataId);\n      outData.stringBytes =\n      backend_util.fromStringArrayToUint8(outVals);\n      inputs2D.forEach(t => backend.disposeData(t.dataId));\n      return out;\n    }\n    const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n    let sumInnerDims =\n    0;\n    const innerDims = $inputs.map(input => {\n      const innerDim = util.sizeFromShape(input.shape.slice(axis));\n      sumInnerDims += innerDim;\n      return innerDim;\n    });\n    const inVals = $inputs.map(input =>\n    backend.typedArrayFromHeap(input));\n    const outVals = backend.typedArrayFromHeap(out);\n    for (let b = 0; b <\n    batchDim; b++) {\n      let outOffset = b * sumInnerDims;\n      for (let i = 0; i < inVals.length; i++) {\n        const\n        innerDim = innerDims[i];\n        const inOffset = b * innerDim;\n        const vals = inVals[i].subarray(inOffset,\n        inOffset + innerDim);\n        outVals.set(vals, outOffset);\n        outOffset += innerDim;\n      }\n    }\n    return\n    out;\n  }\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n\n*\n\nimport { backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmConv2d: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\n  function conv2d(\n    args: { inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs }) {\n    const { inputs, attrs, backend } = args;\n    const { x, filter } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const { strides, dilations, pad, dimRoundingMode, dataFormat } = attrs;\n    const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, false, $dataFormat);\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels = convInfo.inChannels;\n    const outputChannels = convInfo.outChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n        `wasm backend Conv2D does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n    }\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n      outputChannels, outId);\n    return out;\n  }\n\n  export const conv2DConfig: KernelConfig = {\n    kernelName: Conv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: conv2d as { } as KernelFunc\n  }; \n}\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number, filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n  outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n  xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride: number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
```

```

BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n ]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend:
BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat,
dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n
inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n
inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2,
xBatchStride, xRowStride,\n xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n
yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n
kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
conv2DBackpropInput as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", "/*\n * @license\n
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from

```

```
./Unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { cast } from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest = 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n    'number', // out id\n  ]);\n\n  function cropAndResize(args: {\n    backend: BackendWasm,\n    inputs: CropAndResizeInputs,\n    attrs: CropAndResizeAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { method, extrapolationValue, cropSize } = attrs;\n    const { image, boxes, boxInd } = inputs;\n    const numBoxes = boxes.shape[0];\n    const [cropHeight, cropWidth] = cropSize as [number, number];\n    const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n    let imagesData = backend.dataIdMap.get(image.dataId);\n    let castedData;\n    if (image.dtype !== 'float32') {\n      castedData = cast({ backend, inputs: { x: image }, attrs: { dtype: 'float32' }});\n      imagesData = backend.dataIdMap.get(castedData.dataId);\n    }\n    const imagesId = imagesData.id;\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n    const out = backend.makeOutput(outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n    wasmCropAndResize(\n      imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n      cropWidth,\n      InterpolationMethod[method as {}] as keyof typeof InterpolationMethod,\n      extrapolationValue, outId);\n    if (castedData !== null) {\n      backend.disposeData(castedData.dataId);\n    }\n    return out;\n  }\n\n  export const cropAndResizeConfig: KernelConfig = {\n    kernelName: CropAndResize,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: cropAndResize as {} as KernelFunc\n  }; \n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\nimport { transpose } from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n  finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /*void*/, [\n    'number', // x_id\n    'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n    'number', // dtype\n  ]);\n\n  export function cumsum(\n    args: {\n      inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs\n    }): TensorInfo {\n    const { inputs, backend, attrs } = args;\n    const { x } = inputs;\n    const { axis,
```

```

exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis
to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n
if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n
const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n
backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n
const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n
backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n
'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n
'number', // outId\n ]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs:
DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight
= (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ?
x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const
outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth =
inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize,
outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const
out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const
xId = xData.id;\n const xStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n const outStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n\n"/**\n * @license\n *
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```

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```
=====
*
import { backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';
import { BackendWasm } from '../backend_wasm';
let wasmDepthwiseConv2d = (xId: number, batchSize: number, inputHeight: number, inputWidth: number,
filterId: number, filterHeight: number, filterWidth: number, padTop: number,
padRight: number, padBottom: number, padLeft: number, isSamePad: number,
dilationHeight: number, dilationWidth: number, strideHeight: number, strideWidth: number, inputChannels: number,
outputChannels: number, outId: number) => void;
function setup(backend: BackendWasm) {
  wasmDepthwiseConv2d = backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [
    'number', // xId
    'number', // batchSize
    'number', // inputHeight
    'number', // inputWidth
    'number', // filterId
    'number', // filterHeight
    'number', // filterWidth
    'number', // padTop
    'number', // padRight
    'number', // padBottom
    'number', // padLeft
    'number', // isSamePad
    'number', // dilationHeight
    'number', // dilationWidth
    'number', // strideHeight
    'number', // strideWidth
    'number', // inputChannels
    'number', // outputChannels
    'number', // outId
  ]);
  function depthwiseConv2d(args: {
    inputs: DepthwiseConv2dNativeInputs,
    backend: BackendWasm,
    attrs: DepthwiseConv2dNativeAttrs
  }) {
    const { inputs, attrs, backend } = args;
    const { x, filter } = inputs;
    const xId = backend.dataIdMap.get(x.dataId).id;
    const filterId = backend.dataIdMap.get(filter.dataId).id;
    const { strides, dilations, pad, dimRoundingMode } = attrs;
    const $dilations = dilations == null ? [1, 1] : dilations;
    const convInfo = backend_util.computeConv2DInfo(
      (x as Tensor4D).shape, (filter as Tensor4D).shape,
      strides,
      ($dilations as number | [number, number]), pad, dimRoundingMode,
      true /* depthwise */);
    const filterHeight = convInfo.filterHeight;
    const filterWidth = convInfo.filterWidth;
    const padTop = convInfo.padInfo.top;
    const padRight = convInfo.padInfo.right;
    const padBottom = convInfo.padInfo.bottom;
    const padLeft = convInfo.padInfo.left;
    const dilationHeight = convInfo.dilationHeight;
    const dilationWidth = convInfo.dilationWidth;
    const strideHeight = convInfo.strideHeight;
    const strideWidth = convInfo.strideWidth;
    const inputChannels = convInfo.inChannels;
    const outputChannels = convInfo.outChannels;
    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;
    if (convInfo.dataFormat !== 'channelsLast') {
      throw new Error(
        `wasm backend DepthwiseConv2dNative does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);
    }
    const out = backend.makeOutput(convInfo.outShape, 'float32');
    const outId = backend.dataIdMap.get(out.dataId).id;
    wasmDepthwiseConv2d(
      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,
      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,
      dilationHeight, dilationWidth, strideHeight, strideWidth,
      inputChannels, outputChannels, outId);
    return out;
  }
  export const depthwiseConv2dNativeConfig: KernelConfig = {
    kernelName: DepthwiseConv2dNative,
    backendName: 'wasm',
    setupFunc: setup,
    kernelFunc: depthwiseConv2d as {} as KernelFunc
  };
}
/**
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```

```
=====
*
import { Elu, KernelConfig } from '@tensorflow/tfjs-core';
import { createUnaryKernelConfig } from '../unary_kernel';
export const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);
/**
 * @license

```


'wasm',\n kernelFunc: fill as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n  args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n  const {image} = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  wasmFlipLeftRight(\n    imageId, batch, imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig:\n  KernelConfig = {\n    kernelName: FlipLeftRight,\n    backendName: 'wasm',\n    kernelFunc: flipLeftRight as { } as KernelFunc,\n    setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from '../binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n  createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
```

```

TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet
wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n  FusedBatchNorm, null /* void */,\n  ['number', 'number',
'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n  backend:
BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const
{backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} =
inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId =
backend.dataIdMap.get(mean.dataId).id;\n  const varianceId = backend.dataIdMap.get(variance.dataId).id;\n  const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n  const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n  const out = backend.makeOutput(x.shape, x.dtype);\n  // Short-
circuit zero-sized tensors.\n  if (util.sizeFromShape(x.shape) === 0) {\n    return out;\n  }\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmBatchNorm(\n    xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n  return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n  kernelName:
FusedBatchNorm,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedBatchNorm as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

```

```

=====\n
*/\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{FusableActivation} from './types';\n\nlet wasmFusedConv2d: (\n  xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number,
padTop: number, padRight: number, padBottom: number,\n  padLeft: number, isSamePad: number,
dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels:
number, outputChannels: number, activation: number,\n  preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n  'number', // xId\n  'number', //
batchSize\n  'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterId\n  'number', //
filterHeight\n  'number', // filterWidth\n  'number', // biasId\n  'number', // padTop\n  'number', // padRight\n
'number', // padBottom\n  'number', // padLeft\n  'number', // isSamePad\n  'number', // dilationHeight\n
'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number', //
inputChannels\n  'number', // outputChannels\n  'number', // activation\n  'number', //
preluActivationWeightsId\n  'number', // leakyreluAlpha\n  'number', // outId\n ]);\n}\n\nfunction
fusedConv2d(args: {\n  inputs: FusedConv2DInputs,\n  backend: BackendWasm,\n  attrs: FusedConv2DAttrs\n})
{\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias, preluActivationWeights} = inputs;\n  const {\n
strides,\n  pad,\n  dilations,\n  dataFormat,\n  dimRoundingMode,\n  activation,\n  leakyreluAlpha\n } =
attrs;\n\n  const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode);\n\n  const fusedActivation =\n  FusableActivation[activation as {} as keyof typeof FusableActivation];\n  if (fusedActivation === null) {\n
throw new Error(\n    `${activation} activation not yet supported for FusedConv2D` +\n    `in the wasm backend.`);\n
}\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n  const outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if
(bias != null) {\n    const biasData = backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n

```



```

throw new Error(\n      `FusedConv2D only supports rank-1 bias but got ` +\n      `rank
${biasData.shape.length}.`);\n  }\n  if (biasData.shape[0] !== outputChannels) {\n    throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not ` +\n      `match the number of output channels
(${outputChannels})`);\n  }\n  biasId = biasData.id;\n  }\n  const filterHeight = convInfo.filterHeight;\n  const
filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight =
convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const
strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize =
convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n  \n  if
(dataFormat !== 'NHWC') {\n    throw new Error(\n      `wasm backend FusedConv2D does not support
dataFormat:` +\n      `${dataFormat}`. Please use 'NHWC'.`);\n  }\n  \n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights == null ?\n    0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n  \n  wasmFusedConv2d(\n    xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n    biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n    fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n  \n  return out;\n  }\n  \n  export const fusedConv2DConfig:
KernelConfig = {\n    kernelName: FusedConv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:
fusedConv2d as {} as KernelFunc\n  };n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n  \n  function
fusedDepthwiseConv2d(args: {\n    inputs: FusedDepthwiseConv2DInputs,\n    backend: BackendWasm,\n    attrs:
FusedDepthwiseConv2DAttrs\n  }) {\n    const {inputs, attrs, backend} = args;\n    const {x, filter, bias,
preluActivationWeights} = inputs;\n    const {\n      strides,\n      pad,\n      dilations,\n      dataFormat,\n
dimRoundingMode,\n      activation,\n      leakyreluAlpha\n    } = attrs;\n    \n    const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n

```

```

pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n  FusableActivation[activation as { }
as key of typeof FusableActivation];\n if (fusedActivation == null) {\n  throw new Error(\n    `${activation}
activation not yet supported for FusedDepthwiseConv2D` +\n    `in the wasm backend.`);\n }\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const
outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n  const biasData =
backend.dataIdMap.get(bias.dataId);\n  if (biasData.shape.length !== 1) {\n  throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n    `rank ${biasData.shape.length}.`);\n  }\n\n
if (biasData.shape[0] !== outputChannels) {\n  throw new Error(\n    `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n    `match the number of output channels (${outputChannels})`);\n  }\n\n
biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n  throw new Error(\n    `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n    `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n  0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n  xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n  biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n  dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n  kernelName: FusedDepthwiseConv2D,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n\n`/*\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
`License`);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an `AS IS` BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppDType} from './types';\n\nlet
wasmGatherNd: (\n  xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n  sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n  'number', // xId\n
'number', // dtype\n  'number', // indicesId\n  'number', // numSlices\n  'number', // sliceRank\n  'number', //
sliceSize\n  'array', // strides\n  'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} =
inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params,
indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n  return
out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n
const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData =
backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmGatherNd(\n  xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n  stridesBytes,

```

```

outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherNd};\n", "/*\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n\nimport { backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,\n  TensorInfo, TypedArray, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from\n  './backend_wasm';\nimport { reshape } from './Reshape';\nimport { CppDType } from './types';\n\nlet wasmGather:\n  (\n    xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n    indicesId: number, batchSize:\n    number, outStrides: Uint8Array,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n    'number', // xId\n    'number', // dtype\n    'array', //\n    xStrides\n    'number', // stridesSize\n    'number', // indicesId\n    'number', // batchSize\n    'array', //\n    outStrides\n    'number' // outId\n  ]);\n\n  function gatherV2(\n    args: { backend: BackendWasm, inputs:\n    GatherV2Inputs, attrs: GatherV2Attrs }):\n    TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { x,\n    indices } = inputs;\n    const { axis, batchDims } = attrs;\n\n    // Throw error when any index is out of bound.\n    const\n    parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n    const indicesVals = backend.readSync(indices.dataId) as\n    TypedArray;\n    const axisDim = x.shape[parsedAxis];\n    for (let i = 0; i < indicesVals.length; ++i) {\n      const index\n      = indicesVals[i];\n      util.assert(\n        index <= axisDim - 1 && index >= 0,\n        () =>\n        `GatherV2: the\n        index value ${index} is not in [0, ${axisDim - 1}]`);\n    }\n\n    const shapeInfo =\n    backend_util.segment_util.collectGatherOpShapeInfo(\n      x as Tensor, indices as Tensor, parsedAxis,\n      batchDims);\n    const flattenX = reshape({\n      inputs: { x },\n      attrs: {\n        shape: [\n          shapeInfo.batchSize,\n          shapeInfo.outerSize, shapeInfo.dimSize,\n          shapeInfo.sliceSize\n        ]\n      },\n      backend\n    });\n    const\n    indicesSize = util.sizeFromShape(indices.shape);\n    const flattenIndex = reshape({\n      inputs: { x: indices },\n      attrs:\n      { shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize] },\n      backend\n    });\n    const flattenOutputShape =\n    [\n      shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n      shapeInfo.sliceSize\n    ];\n\n    const out = backend.makeOutput(flattenOutputShape, x.dtype);\n    if (util.sizeFromShape(x.shape) === 0) {\n      return out;\n    }\n\n    const stridesSize = flattenX.shape.length - 1;\n\n    const xData =\n    backend.dataIdMap.get(flattenX.dataId);\n    const xId = xData.id;\n\n    const indicesData =\n    backend.dataIdMap.get(flattenIndex.dataId);\n    const indicesId = indicesData.id;\n\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n\n    const xStridesBytes = new Uint8Array(\n      new\n      Int32Array(util.computeStrides(flattenX.shape)).buffer);\n    const outStridesBytes = new Uint8Array(\n      new\n      Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n    wasmGather(\n      xId, CppDType[x.dtype],\n      xStridesBytes, stridesSize, indicesId,\n      shapeInfo.batchSize, outStridesBytes, outId);\n\n    backend.disposeData(flattenX.dataId);\n    backend.disposeData(flattenIndex.dataId);\n\n    // reshape\n    out.shape =\n    shapeInfo.outputShape;\n\n    return out;\n  }\n\n  export const gatherV2Config: KernelConfig = {\n    kernelName:\n    GatherV2,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: gatherV2 as { } as KernelFunc\n  };}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the\n * specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from

```

```
./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n  createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig }\nfrom './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n  createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n\n*\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from\n './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu,\n    null /* void */, [\n      'number', // x_id\n      'number', // dtype\n      'number', // leakyrelu_alpha\n      'number', //\n      out_id\n    ]);\n\n  export function leakyRelu(\n    args: \n      { inputs: LeakyReluInputs, attrs: LeakyReluAttrs,\n        backend: BackendWasm }):\n    TensorInfo {\n      const { inputs: { x }, attrs: { alpha }, backend } = args;\n\n      const xId =\n        backend.dataIdMap.get(x.dataId).id;\n      // According to TF API, LeakyRelu returns float32 when input is either\n      float32\n      // or int32.\n      const out = backend.makeOutput(x.shape, 'float32');\n\n      if (util.sizeFromShape(x.shape)\n        !== 0) {\n        const outId = backend.dataIdMap.get(out.dataId).id;\n        wasmFunc(xId, CppDType[x.dtype], alpha,\n          outId);\n      }\n\n      return out;\n    }\n\n  export const leakyReluConfig: KernelConfig = {\n    kernelName: LeakyRelu,\n    backendName: 'wasm',\n    setupFunc,\n    kernelFunc: leakyRelu as {} as KernelFunc,\n  }; \n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n\n*\nimport { KernelConfig, Less } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n  createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```

*\n\nimport { KernelConfig, LessEqual } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const lessEqualConfig: KernelConfig =\n\ncreateBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { KernelConfig, Log } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
 './unary_kernel';\n\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n\n", "/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { KernelConfig, LogicalAnd } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const logicalAndConfig: KernelConfig =\n\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util } from
 '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
 { permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmMax: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n\nvoid;\n\nfunction setup(backend:
BackendWasm): void {\n\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n\n    'number', // x_id\n\n    'number', // dtype\n\n    'number', // reduce_size\n\n    'number', // out_id\n\n  ]);\n\n  function max(args: { backend:
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs }):\n\n    TensorInfo {\n\n    const { backend, inputs, attrs } = args;\n\n    const { reductionIndices: axis, keepDims } = attrs;\n\n    const { x } = inputs;\n\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n\n    let inputId = xId;\n\n    let input = x;\n\n    const { transposed, axes, originalAxes,
inputWasTransposed } =\n\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n\n      input = transposed;\n\n      inputId =
transposedId;\n\n    }\n\n    const inputRank = input.shape.length;\n\n    backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n\n    const [outShape, reduceShape] =\n\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n\n    const reduceSize =
util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n\n    if
(util.sizeFromShape(input.shape) !== 0) {\n\n      const outId = backend.dataIdMap.get(out.dataId).id;\n\n      wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n\n    }\n\n    if (inputWasTransposed) {\n\n      // dispose of the
transposed tensor.\n\n      backend.disposeData(transposed.dataId);\n\n    }\n\n    if (keepDims) {\n\n      // reshape\n\n      const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n\n      out.shape = newShape;\n\n    }\n\n  }\n\n}

```

```

return out;\n)\n\nexport const maxConfig: KernelConfig = {\n  kernelName: Max,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: max as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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```

=====
\n
*\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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\n
*\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} = args;\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  \n  // TF API supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it because it uses xnpack which only\n  // supports float32.\n  // \n  // Add the following assert only for the WASM backend instead of at core op\n  // level.\n  // \n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype === 'float32',\n    () =>\n      `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n  \n  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n  \n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n  \n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n  }\n  \n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  \n  wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],\n    filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
```

```
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:\nKernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool\n as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n */
```

```
=====\n\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args:\n {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs};\n TensorInfo {\n const {backend, inputs,\n attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =\n backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,\n inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if\n (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId\n !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =\n transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',\n reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId =\n backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if\n (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed\n tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype\n !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:\nKernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {}\n as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n */
```

```
=====\n\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:\n number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n ]);\n}\n\nfunction min(args: {backend:
```



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postPaddingsBytes =\n    new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n  xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n  postPaddingsBytes,\n  MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n  kernelName: MirrorPad,\n  backendName: 'wasm',\n  kernelFunc: mirrorPad as {} as KernelFunc,\n  setupFunc:\n  setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n  createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2020 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {BackendWasm} from './backend_wasm';\n\n// Analogous to `struct Result` in\n `non_max_suppression_impl.h`\n\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the\n * shape equivalent to\n * `Result`\n *\n * export function parseResultStruct(\n  backend: BackendWasm, resOffset:\n  number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const\n  pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const\n  pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,\n  pValidOutputs};\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n * the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
```

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NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n  'number', // Result*\n  [\n  'number', // boxesId\n  'number', // scoresId\n
  'number', // maxOutputSize\n  'number', // iouThreshold\n  'number', // scoreThreshold\n
]);\n}\n\nfunction kernelFunc(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV3Inputs,\n  attrs:
NonMaxSuppressionV3Attrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold,
maxOutputSize, scoreThreshold} = attrs;\n  const {boxes, scores} = inputs;\n  const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n  const
resOffset =\n    wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n  const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n  // Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n  backend.wasm._free(pValidOutputs);\n  const selectedIndicesTensor
=\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n  return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n  kernelName:
NonMaxSuppressionV3,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc as {} as
KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */
=====\n
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n  NonMaxSuppressionV4,\n  'number', // Result*\n  [\n  'number', // boxesId\n
  'number', // scoresId\n  'number', // maxOutputSize\n  'number', // iouThreshold\n  'number', //
scoreThreshold\n  'bool', // padToMaxOutputSize\n  ]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n  inputs: NonMaxSuppressionV4Inputs,\n  attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize} =\n    attrs;\n  const {boxes, scores} = inputs;\n  const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n  const
resOffset = wasmFunc(\n    boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n  const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n  // Since we are not using scores for V4, we have to delete it from the
heap.\n  backend.wasm._free(pSelectedScores);\n  const selectedIndicesTensor =\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n  const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n  return [selectedIndicesTensor,
validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n  kernelName:
NonMaxSuppressionV4,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: nonMaxSuppressionV4 as {} as
KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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```

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```
=====  
*  
import { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,  
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';  
import { BackendWasm } from './backend_wasm';  
import { parseResultStruct } from './NonMaxSuppression_util';  
let wasmFunc:  
(boxesId: number, scoresId: number, maxOutputSize: number,  
iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>  
number;  
function setup(backend: BackendWasm): void {  
  wasmFunc = backend.wasm.cwrap(  
    NonMaxSuppressionV5, 'number', // Result*  
    [ 'number', // boxesId  
      'number', // scoresId  
      'number', // maxOutputSize  
      'number', // iouThreshold  
      'number', // scoreThreshold  
      'number', // softNmsSigma  
    ]);  
  function kernelFunc(args: {  
    backend: BackendWasm,  
    inputs: NonMaxSuppressionV5Inputs,  
    attrs: NonMaxSuppressionV5Attrs  
  }): TensorInfo[] {  
    const { backend, inputs, attrs } = args;  
    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma }  
      = attrs;  
    const { boxes, scores } = inputs;  
    const boxesId = backend.dataIdMap.get(boxes.dataId).id;  
    const scoresId = backend.dataIdMap.get(scores.dataId).id;  
    const resOffset = wasmFunc(  
      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,  
      softNmsSigma);  
    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =  
      parseResultStruct(backend, resOffset);  
    // Since we are not using validOutputs for V5, we have to delete it from the  
    // heap.  
    backend.wasm._free(pValidOutputs);  
    const selectedIndicesTensor =  
      backend.makeOutput([selectedSize, 'int32', pSelectedIndices]);  
    const selectedScoresTensor =  
      backend.makeOutput([selectedSize, 'float32', pSelectedScores]);  
    return [selectedIndicesTensor, selectedScoresTensor];  
  }  
  export const nonMaxSuppressionV5Config: KernelConfig = {  
    kernelName: NonMaxSuppressionV5,  
    backendName: 'wasm',  
    setupFunc: setup,  
    kernelFunc: kernelFunc  
  } as KernelFunc;  
};  
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 * limitations under the License.  
 */  
=====  
*  
import { KernelConfig, NotEqual } from '@tensorflow/tfjs-core';  
import { createBinaryKernelConfig } from './binary_kernel';  
const supportsFullBroadcast = false;  
export const notEqualConfig: KernelConfig =  
createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');  
/**  
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 * limitations under the License.  
 */  
=====  
*  
import { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-  
core';  
import { BackendWasm } from './backend_wasm';  
let wasmOneHot: (indicesId: number, depth:  
number, onValue: number, offValue: number, outId: number) => void;  
function setup(backend:  
BackendWasm) {  
  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [ 'number', // indices_id  
    'number', // depth,  
    'number', // onValue  
    'number', // offValue  
    'number' // out_id  
  ]);  
  function oneHot(  
    args: { inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm }  
  ) {  
    const { inputs,
```

```

backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig:
KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as
{} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const
onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as
{} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\n\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n  args: {inputs: PackInputs, backend:
BackendWasm, attrs: PackAttrs});\n  TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} =
attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n
util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n
util.assert(\n dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n
const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const
expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n
intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-

```

```

core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType}
from './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number', // x.shape.length\n  'number', // x.dtype\n
'array', // pre-paddings\n  'array', // post-paddings\n  'number', // constantValue\n  'number', // outId\n
]);\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n  const outShape = paddings.map(\n    (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-
circuit the computation, since x doesn't have value, only\n    // the shape is used to compute output shape to pad.\n
return fill({\n    backend,\n    attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n  });\n}\n\nconst
xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const
outTensorData = backend.dataIdMap.get(out.dataId);\n  const outId = outTensorData.id;\n\n  const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n  const prePaddingsBytes =\n
new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const postPaddingsBytes =\n  new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n  wasmPadV2(\n    xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n    postPaddingsBytes, constantValue, outId);\n  return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n  kernelName: PadV2,\n  backendName: 'wasm',\n  kernelFunc: pad as {},\n  as
KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n
createBinaryKernelConfig(Pow, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
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=====\n
*/\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n  'number', // x_id\n  'number', // weights_id\n  'number' //
out_id\n  ]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n  const {inputs, backend}
= args;\n  const {x, alpha} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n  let inputId = xId;\n  const input = x;\n  let castedInput = input;\n  if
(input.dtype !== 'float32') {\n    castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n    inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n  }\n\n  const out = backend.makeOutput(x.shape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmPrelu(inputId, weightsId, outId);\n\n  if (input.dtype
!== 'float32') {\n    backend.disposeData(castedInput.dataId);\n  }\n  return out;\n}\n\nexport const preluConfig:

```

KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from  
 '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport  
{ permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmProd: (\n  xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\n\nfunction setup(backend:  
BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n    'number',\n    'number'\n  ]);\n\n  function prod(args: {\n    backend: BackendWasm,\n    inputs: ProdInputs,\n    attrs: ProdAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const { transposed, axes, originalAxes, inputWasTransposed } =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n      const transposedId =\n        backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We  
will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length, input.shape.length);\n    }\n\n    backend_util.assertAxesAreInnerMostDims(\n      'prod', reductionAxes, input.shape.length);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize =\n      util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of  
the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    return out;\n  }\n\n  export const prodConfig: KernelConfig = {\n    kernelName: Prod,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prod as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google  
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```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { rangeImplCPU } from './kernel_utils/shared';\n\nexport const  
range = (\n  args: { backend: BackendWasm, attrs: RangeAttrs }): TensorInfo => {\n    const { backend, attrs } =  
args;\n    const { start, stop, step, dtype } = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n\n    const out = backend.makeOutput([values.length], dtype);\n    const outVals =  
backend.typedArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\nexport const rangeConfig:  
KernelConfig = {\n  kernelName: Range,\n  backendName: 'wasm',\n  kernelFunc: range as { } as  
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the  
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```
=====  
*import {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';import {createBinaryKernelConfig} from  
 './binary_kernel';const supportsFullBroadcast = true;export const realDivConfig: KernelConfig =  
 createBinaryKernelConfig(RealDiv, supportsFullBroadcast);"/** @license Copyright 2019 Google LLC.  
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```

```
=====  
*import {KernelConfig, Relu} from '@tensorflow/tfjs-core';import {createUnaryKernelConfig} from  
 './unary_kernel';export const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);"/** @license  
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 the specific language governing permissions and limitations under the License.*/
```

```
=====  
*import {KernelConfig, Relu6} from '@tensorflow/tfjs-core';import {createUnaryKernelConfig} from  
 './unary_kernel';export const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);"/**  
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 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for  
 the specific language governing permissions and limitations under the License.*/
```

```
=====  
*import {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,  
 util} from '@tensorflow/tfjs-core';import {BackendWasm} from '../backend_wasm';import {cast} from  
 './Cast';let wasmResizeBilinear: (xId: number, batch: number, oldHeight: number, oldWidth: number,  
 numChannels: number, newHeight: number, newWidth: number, alignCorners: number, halfPixelCenters:  
 number, outId: number) => void;function setup(backend: BackendWasm): void {wasmResizeBilinear =  
 backend.wasm.cwrap(ResizeBilinear, null /*void*/, [number, // xId number, // batch number, //  
 oldHeight number, // oldWidth number, // numChannels number, // newHeight number, //  
 newWidth number, // alignCorners number, // halfPixelCenters number // outId]);}function  
 resizeBilinear(args: {backend: BackendWasm, inputs: ResizeBilinearInputs, attrs: ResizeBilinearAttrs}):  
 TensorInfo {const {backend, inputs, attrs} = args;const {images} = inputs;const {alignCorners,  
 halfPixelCenters, size} = attrs;const [newHeight, newWidth] = size;const [batch, oldHeight, oldWidth,  
 numChannels] = images.shape;const outShape = [batch, newHeight, newWidth, numChannels];let xData =  
 backend.dataIdMap.get(images.dataId);let castedData;if (xData.dtype !== 'float32') {castedData =  
 cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});xData =  
 backend.dataIdMap.get(castedData.dataId);}const xId = xData.id;const out =
```

```

backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n  return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n  xId, batch, oldHeight,\n  oldWidth, numChannels, newHeight, newWidth,\n  alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if\n (castedData != null) {\n  backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const\n resizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear,\n  backendName: 'wasm',\n  setupFunc:\n  setup,\n  kernelFunc: resizeBilinear as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {identity} from\n './Identity';\n\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array,\n  axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction\n setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n    'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number'\n    // out_id\n  ]);\n}\n\nexport function reverse(\n  args: {inputs: ReverseInputs, backend: BackendWasm, attrs:\n  ReverseAttrs}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {dims} =\n  attrs;\n\n  const axes = util.parseAxisParam(dims, x.shape);\n\n  if (x.shape.length === 0) {\n    return\n    identity({inputs: {x}, backend});\n  }\n\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const xId =\n  backend.dataIdMap.get(x.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const axesBytes =\n  new Uint8Array(new Int32Array(axes).buffer);\n  const outShapeBytes = new Uint8Array(new\n  Int32Array(x.shape).buffer);\n\n  wasmReverse(\n    xId, axesBytes, axes.length, outShapeBytes, x.shape.length,\n    outId);\n\n  const reshaped =\n    reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n  backend.disposeData(out.dataId);\n  return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n  kernelName: Reverse,\n  backendName: 'wasm',\n  kernelFunc: reverse as { } as KernelFunc,\n  setupFunc:\n  setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *

```

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=====\n
*/\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,\n TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport\n {BackendWasm} from './backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight:\n  number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n  fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction\n setup(backend: BackendWasm) {\n  wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n    'number', // xId\n    'number', //\n    batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', //\n    radians\n    'number', // centerX\n    'number', // centerY\n    'array', // fillBytes\n    'number', // fillLength\n    'number', // outId\n  ]);\n}\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,\n  backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =\n  args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n\n  const out =

```



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backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n const [centerX, centerY] =\n  backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues =
typeof fillValue === 'number' ?\n  [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n  [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n  imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n  centerY, fillBytes, fillValues.length, outId);\n return out;\n);\n\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup;\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from
'/types';\n\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CCppType, sliceRank:
number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', //
sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n
'number' // outId\n  ]);\n\nfunction scatterNd(\n  args:\n    {backend: BackendWasm, inputs:
ScatterNdInputs, attrs: ScatterNdAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices,
updates} = inputs;\n    const {shape} = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if
(util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const {sliceRank, numUpdates, sliceSize, strides,
outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n\n    const indicesData =
backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    const updatesData =

```

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backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new
  Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
  wasmScatterNd(\n   indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n   sliceSize,
  stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n
  kernelName: ScatterNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: scatterNd as {} as
  KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
  Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
  Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
  on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
  implied.\n * See the License for the specific language governing permissions and\n * limitations under the
  License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
  {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,
  offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect =
  backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n    'number', // offset\n    'number', // outId\n  ]);\n\n  function select(args: {inputs: SelectInputs, backend:
  BackendWasm}) {\n    const {inputs, backend} = args;\n    const {condition, t, e} = inputs;\n\n    const conditionId =
  backend.dataIdMap.get(condition.dataId).id;\n    const tId = backend.dataIdMap.get(t.dataId).id;\n    const eId =
  backend.dataIdMap.get(e.dataId).id;\n    const out = backend.makeOutput(t.shape, t.dtype);\n    const outId =
  backend.dataIdMap.get(out.dataId).id;\n\n    const cRank = condition.shape.length;\n    const tRank =
  t.shape.length;\n\n    const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n      1:\n    util.sizeFromShape(t.shape.slice(1));\n\n    wasmSelect(conditionId, tId, eId, offset, outId);\n    return out;\n  }\n\n  export const selectConfig: KernelConfig = {\n    kernelName: Select,\n    backendName: 'wasm',\n    kernelFunc: select as {}
  as KernelFunc,\n    setupFunc: setup\n  };\n  }\n  ", "/*\n  * @license\n  * Copyright 2019 Google LLC. All Rights
  Reserved.\n  * Licensed under the Apache License, Version 2.0 (the \"License\");\n  * you may not use this file
  except in compliance with the License.\n  * You may obtain a copy of the License at\n  *
  http://www.apache.org/licenses/LICENSE-2.0\n  *\n  * Unless required by applicable law or agreed to in writing,
  software\n  * distributed under the License is distributed on an \"AS IS\" BASIS,\n  * WITHOUT WARRANTIES
  OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License for the specific language
  governing permissions and\n  * limitations under the License.\n  *

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```

=====
*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
  core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
  void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
  void */, ['number', 'number']);\n\n  function sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n
  TensorInfo {\n    const {backend, inputs: {x}} = args;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n
    const out = backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n
    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(out.shape) === 0) {\n      return out;\n    }\n\n
    wasmFunc(xId, outId);\n    return out;\n  }\n\n  export const sigmoidConfig: KernelConfig = {\n    kernelName: 'Sigmoid',\n
    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: sigmoid as {} as KernelFunc\n  };\n  }\n  ", "/*\n  * @license\n  *
  Copyright 2019 Google LLC. All Rights Reserved.\n  * Licensed under the Apache License, Version 2.0 (the
  \"License\");\n  * you may not use this file except in compliance with the License.\n  * You may obtain a copy of the
  License at\n  * http://www.apache.org/licenses/LICENSE-2.0\n  *\n  * Unless required by applicable law or
  agreed to in writing, software\n  * distributed under the License is distributed on an \"AS IS\" BASIS,\n  *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License for the
  specific language governing permissions and\n  * limitations under the License.\n  *

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=====
*\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n  void;\nfunction setup(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n  'number', // xId\n  'number', // outId\n
'number', // channels\n  'number' // batch\n]);\n}\nfunction softmax(\n  args: {backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n  TensorInfo {\n  const {backend, inputs: {logits}, attrs: {dim}} =
args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape,
logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channels = logits.shape[dim];\n
const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if
(util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId, channels, batch);\n  return
out;\n}\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: softmax as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,
SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {padV2Config} from
'./PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\nfunction
spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:
SpaceToBatchNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,
paddings} = attrs;\n\n  const prod = util.sizeFromShape(blockShape);\n\n  const completePaddings: Array<[number,
number]> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<[number, number]>));\n\n  for (let i = 1 +
blockShape.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n\n  const paddedX =
padV2Config.kernelFunc({\n    inputs: {x},\n    backend,\n    attrs: {paddings: completePaddings, constantValue:
0}\n  }) as TensorInfo;\n\n  const reshapedPaddedShape =\n    backend_util.getReshaped(paddedX.shape,
blockShape, prod, false);\n\n  const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n
  reshapedPaddedShape.length, blockShape.length, false);\n\n  const flattenShape =\n    backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n  const reshapeInputs:
ReshapeInputs = {x: paddedX};\n  const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n  const
paddedXReshaped =\n    reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n  const transposeInputs:
TransposeInputs = {x: paddedXReshaped};\n  const transposeAttrs:\n    TransposeAttrs = {perm:
permutedReshapedPaddedPermutation};\n  const paddedXT =\n    transpose({inputs: transposeInputs, backend,
attrs: transposeAttrs});\n\n  const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n  const

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resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n  {inputs:\n  resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return\n result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-\n  core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from\n  './backend_wasm';\nimport {slice} from './Slice';\n\nexport function splitV(\n  args: {inputs: SplitVInputs, attrs:\n  SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n  const\n  {numOrSizeSplits, axis} = attrs;\n\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n  const splitSizes =\n  backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n  const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] =\n    s;\n    const xSlice =\n    slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n    begin[$axis] += s;\n    return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName:\n  'wasm',\n  kernelFunc: splitV as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n  './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n  './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
```

```

from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig
=\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n    'number', // x_id\n
'number', // alpha\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\n\nfunction step(\n  args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {alpha} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n
const out =
backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmStep(xId,
alpha, CppDType[x.dtype], outId);\n    return out;\n  }\n\nexport const stepConfig: KernelConfig = {\n  kernelName:
Step,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: step as {} as KernelFunc\n};\n"/**\n *
@license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
 './Reshape';\n\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,
xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
'number', // xId\n    'array', // xStrides\n    'number', // xRank\n    'array', // beginBytes\n    'array', // endBytes\n
'array', // stridesBytes\n    'array', // outShapeBytes\n    'array', // outStridesBytes\n    'number', //
outShapeLength\n    'number', // outId\n  ]);\n}\n\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n
inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n
newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n
sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n
      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n      newAxisMask, shrinkAxisMask);\n\n
let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x},
backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is
memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have
rank at least 1, got: ${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n
// To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape:
finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out =
backend.makeOutput(finalShapeSparse, 'float32');\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const

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xStridesBytes =\n    new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n  const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);\n  const endBytes = new Uint8Array(new
Int32Array($end).buffer);\n  const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n  const
outputShapeBytes =\n    new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n  const outStridesBytes =
new Uint8Array(\n    new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmStridedSlice(\n    xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n    outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n  result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n  backend.disposeData(out.dataId);\n
}\n\n  return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as {} as KernelFunc\n};\n"/**\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n    'number', // reduce_size\n    'number', // dtype\n    'number', // out_id\n  ]);\n\n  function sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let
inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n    const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n    // transpose was
not a no-op. We will need to dispose of this\n    // once we are done.\n    input = transposed;\n    inputId =
transposedId;\n    reductionAxes = backend_util.getInnerMostAxes(\n    reductionAxes.length,
input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n    'sum', reductionAxes,
input.shape.length);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmSum(inputId, reduceSize, CCppType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n}

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return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nlet wasmTile: (n  xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array, newShapeSize: number, dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', // x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n  ]);\n\n  function tile(\n    args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const {reps} = attrs;\n    const newShape: number[] = new Array(x.shape.length);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = x.shape[i] * reps[i];\n    }\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n    const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n    const out = backend.makeOutput(newShape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmTile(xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length, CppDType[out.dtype], outId);\n    return out;\n  }\n\n  export const tileConfig: KernelConfig = {\n    kernelName: Tile,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: tile as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number',
// x.shape.length\n  'number', // x.dtype\n  'number', // k\n  'bool', // sorted\n  'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n\n}\n\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n
const {k, sorted} = attrs;\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n  const outIndices =
backend.makeOutput(outputShape, 'int32');\n  const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n  wasmTopK(\n    xId, xShapeBytes, x.shape.length,
CppType[x.dtype], k, sorted,\n    outValuesId, outIndicesId);\n\n  return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: topk as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmTransform: (\n  imageId:
number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth:
number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n
stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,
null /*void*/, [\n  'number', // imageId\n  'number', // transformsId\n  'bool', // isBatchTransform\n  'number',
// batch\n  'number', // outHeight\n  'number', // outWidth\n  'number', // numChannels\n  'number', //
imageWidth\n  'number', // imageHeight\n  'array', // strides\n  'number', // stridesLength\n  'number', //
interpolationModeId\n  'number', // fillModeId\n  'number', // fillValue\n  'number' // outId\n
]);\n\n}\n\nfunction transform(\n  args:\n  {backend: BackendWasm, inputs: TransformInputs, attrs:
TransformAttrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {image, transforms} = inputs;\n
const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n  const [batch, imageHeight, imageWidth,
numChannels] = image.shape;\n  const [outHeight, outWidth] =\n  outputShape != null ? outputShape :
[imageHeight, imageWidth];\n  const outShape =\n  [batch, outHeight, outWidth,\n  numChannels] as
[number, number, number, number];\n  const strides =\n  new Uint8Array(new
Int32Array(util.computeStrides(image.shape)).buffer);\n\n  const out = backend.makeOutput(outShape,
image.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const imageData =
backend.dataIdMap.get(image.dataId);\n  const imageId = imageData.id;\n\n  const transformsData =
backend.dataIdMap.get(transforms.dataId);\n  const transformsId = transformsData.id;\n\n  const
interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n  let fillModeId;\n  switch (fillMode) {\n  case
'constant':\n    fillModeId = 1;\n    break;\n  case 'reflect':\n    fillModeId = 2;\n    break;\n  case 'wrap':\n
fillModeId = 3;\n    break;\n  case 'nearest':\n    fillModeId = 4;\n    break;\n  default:\n    fillModeId = 1;\n

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break;\n }\n\n wasmTransform(\n  imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n  outWidth, numChannels, imageWidth, imageHeight, strides,\n  image.shape.length - 1, interpolationModeId,\n  fillModeId, fillValue,\n  outId);\n\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as { } as\n  KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

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=====\n
*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { slice } from\n './Slice';\n\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n  const { inputs, backend, attrs } = args;\n  const { value } = inputs;\n  let { axis } = attrs;\n  if (axis <\n  0) {\n  axis += value.shape.length;\n  }\n\n  const numOutputs = value.shape[axis];\n  const rank =\n  value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;\n  i++) {\n  if (i !== axis) {\n  outShape[outIndex++] = value.shape[i];\n  }\n  }\n  const outs: TensorInfo[] = new\n  Array(numOutputs);\n  const begin = new Array(rank).fill(0);\n  const size = value.shape.slice();\n  size[axis] = 1;\n  for (let i = 0; i < outs.length; i++) {\n  begin[axis] = i;\n  outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },\n  backend});\n  }\n  return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n}\n\nexport const\n  unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as { } as\n  KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

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=====\n
*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from '@tensorflow/tfjs-core';\n\nimport\n { BackendWasm } from '../backend_wasm';\n\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend:\n  BackendWasm }) {\n  const { inputs: { x }, backend } = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const\n  zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike\n  as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

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=====\n
*\n\n//\n\nWe explicitly import the modular kernels so they get registered in the\n// global registry when we compile the\n// library. A modular build would replace\n// the contents of this file and import only the kernels that are\n// needed.\n\nimport { KernelConfig, registerKernel } from '@tensorflow/tfjs-core';\n\nimport { fusedMatMulConfig }\n from './kernels/_FusedMatMul';\n\nimport { absConfig } from './kernels/Abs';\n\nimport { addConfig } from

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./kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport
{anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig}
from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport
{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport
{ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport
{concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport
{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from
 './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from
 './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig}
from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from
 './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from
 './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from
 './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
 './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
 './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
 './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
 './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
 './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
 './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
 './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
 './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
 './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
 './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
 './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst

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kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n
argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n
ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n
cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n
depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n
flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n fusedBatchNormConfig,\n
fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n
greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n
logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n
minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n
nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n
onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n
realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n
rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n
sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n
squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n
tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n
zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n", "/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n ])));\n\n**\n * True if threads are supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n ]));\n } catch (e) {\n return false;\n };\n\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = __filename;\n return
(function(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU8}function

```

```

GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram="/.this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"];var scriptDirectory="";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"\\"}else{scriptDirectory=__dirname+"\\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=
nodePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"\\");arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["in
spect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)};readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=="undefined" &&

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_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("\blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("\^")+1)}else{scriptDirectory=""}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("\fs");if(!nodePath)nodePath=require("\path");filename=n
odePath["normalize\"](filename);return
nodeFS["readFileSync\"](filename,binary?null:\utf8());readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open("\GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("\perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments\"])arguments_=Module["arguments"];if(Module["thisProgram\"])thisProgram=
Module["thisProgram"];if(Module["quit\"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary\"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("\no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("\Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,\Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str="";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function

```

```

UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;+i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;+i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmmM
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors
()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var

```

```

runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]}(ru
nDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("\nPthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what="\nabort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(--numWorkersToLoad)removeRunDependency("wasm-
instantiate")})))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("wasm-instantiate")}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm

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callback failed with error: \"+e);return false }} instantiateAsync().catch(readyPromiseReject);return{ }} var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0)}};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
__emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\": \"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}}var

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PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb);initWorker:function(){,t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\\":\\"exit\\"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\\":\\"cancelDone\\"})},terminateAllThreads:function(){for(var t in
PThread pthreads){var
pthread=PThread pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThre
ad pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){delete
PThread pthreads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker pthread);worker pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker pthread)PThread.currentProxiedOperationCallerThread=worker pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){var
thread=PThread pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"])}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\' to target pthread '+d["targetThread"]+', but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\\"processQueuedMainThread
Work\\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\\"spawnThread\\"){spawnThread(e.data)}else
if(cmd===\\"cleanupThread\\"){cleanupThread(d["thread"])}else
if(cmd===\\"killThread\\"){killThread(d["thread"])}else
if(cmd===\\"cancelThread\\"){cancelThread(d["thread"])}else
if(cmd===\\"loaded\\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\\"print\\"){out("Thread \"+d["threadId"]+"\\":

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\'+d[\text\'])} else if(cmd===\printErr\'){err(\Thread \'+d[\threadId\']+\' : \'+d[\text\'])} else
if(cmd===\alert\'){alert(\Thread \'+d[\threadId\']+\' : \'+d[\text\'])} else if(cmd===\exit\'){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)} } else
if(cmd===\exitProcess\'){try{exit(d[\returnCode\'])} catch(e){if(e instanceof ExitStatus)return;throw e } } else
if(cmd===\cancelDone\'){PThread.returnWorkerToPool(worker)} else
if(cmd===\objectTransfer\'){PThread.receiveObjectTransfer(e.data)} else
if(e.data.target===\setimmediate\'){worker.postMessage(e.data)} else{err(\worker sent an unknown command
\'+cmd)} PThread.currentProxiedOperationCallerThread=undefined}; worker.onerror=function(e){err(\pthread sent
an error! \'+e.filename+\' : \'+e.lineno+\' :
\'+e.message)}; if(ENVIRONMENT_IS_NODE){worker.on(\message\',function(data){worker.onmessage({data:d
ata})}); worker.on(\error\',function(data){worker.onerror(data)}); worker.on(\exit\',function(data){})} worker.post
Message({\cmd\:\load\,\urlOrBlob\:\Module[\mainScriptUrlOrBlob\]|\_scriptId\,\wasmMemory\:\wasmMe
memory\,\wasmModule\:\wasmModule}), allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\tfjs-
backend-wasm-threaded-simd.worker.js\'); PThread.unusedWorkers.push(new
Worker(pthreadMainJs)), getNewWorker:function(){if(PThread.unusedWorkers.length===0){PThread.allocateUnus
edWorker(); PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])} if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop(); else return null}, busySpinWait:function(msecs){var
t=performance.now()+msecs; while(performance.now()<t){}}; function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax); stackRestore(stackTop
)} Module[\establishStackSpace\]=establishStackSpace; function getNoExitRuntime(){return
noExitRuntime} Module[\getNoExitRuntime\]=getNoExitRuntime; function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)} Module[\invokeEntryPoint\]=invokeEntryPoint; function
__assert_fail(condition,filename,line,func){abort(\Assertion failed: \'+UTF8ToString(condition)+\' , at:
\'+[filename?UTF8ToString(filename):\unknown filename\'],line,func?UTF8ToString(func):\unknown
function\')} function __call_main(argc,argv){var returnCode=_main(argc,argv)} var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\hrtime\](); return t[0]*1e3+t[1]/1e6} } else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\__performance_now_clock_drift\']} } else if(typeof
dateNow!===\undefined\'){_emscripten_get_now=dateNow} else _emscripten_get_now=function(){return
performance.now()}; function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value; return
value} function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)} function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId===mainThreadId){postMessag
e({\cmd\:\processQueuedMainThreadWork\'})} } else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\targetThread\':targetThreadId,\cmd\:\processThreadQueue
e\'})} } else {var pthread=PThread.pthreads[targetThreadId]; var
worker=pthread&&pthread.worker; if(!worker){return} worker.postMessage({\cmd\:\processThreadQueue\'}) } ret
urn 1} function _abort(){abort()} function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf); return ASM_CONSTS[code].apply(null,args)} function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){} function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout); if(ret===\timed-out\')return-
73;if(ret===\not-equal\')return-6;if(ret===\ok\')return 0;throw\Atomics.wait returned an unexpected value
\'+ret} else {if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6} var
tNow=performance.now(); var tEnd=tNow+timeout; var

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lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("\os").cpus().length;return
navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d

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deferredCalls.splice(i,1);--i} },canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){ var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return"";if(target==window)return"#window";
if(target==screen)return"#screen";return
target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-

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4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+4>>2]=height;if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prevViewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else if(canvas.canvasSharedPtr){var targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function _emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return _emscripten_set_canvas_element_size_calling_thread(target,width,height)}function _emscripten_set_canvas_element_size(target,width,height){var canvas=findCanvasEventTarget(target);if(canvas){return _emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return _emscripten_set_canvas_element_size_main_thread(target,width,height)}}function _emscripten_set_current_thread_status(newStatus){}function _emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ext["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcount){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var ext=ctx.getExtension("OES_vertex_array_object");if(ext){ctx["createVertexArray"]=function(){return ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao){return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var ext=ctx.getExtension("WEBGL_draw_buffers");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffersWEBGL"](n,bufs)};return 1}}function __webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("WEBGL_multi_draw"))}var GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],contexts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return ret},getSource:function(shader,count,string,length){var source="";for(var i=0;i<count;++i){var len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return source},createContext:function(canvas,webGLContextAttributes){var ctx=canvas.getContext("webgl",webGLContextAttributes);if(!ctx)return 0;var handle=GL.registerContext(ctx,webGLContextAttributes);return handle},registerContext:function(ctx,webGLContextAttributes){var handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof webGLContextAttributes.enableExtensionsByDefault==="undefined"||webGLContextAttributes.enableExtensionsByDefault){GL.initExtensions(context)}return

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handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)===\"|\"){name=name.slice(0,name.lastIndexOf(\"|\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GLctx.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+\"|\"+j+\"|\";loc=GLctx.getUniformLocation(p,n);id=GLctx.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=[\"default\", \"low-power\", \"high-performance\"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_
I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
__fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function __fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
__fd_write(fd,iow,iocvnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iow,iocvnt,pnum);var num=0;for(var i=0;i<iocvnt;i++){var

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ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j]);num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd":"run","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthr
ead=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList);if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer==="undefined"){err("Current
environment does not support SharedArrayBuffer, pthreads are not available!");return
6}if(!pthread_ptr){err("pthread_create called with a null thread pointer!");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw"Canceled!"}function

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_emsripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce("Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/threads.html#blocking-on-the-main-browser-thread")}function
__emsripten_do_pthread_join(thread,status,block){if(!thread){err("pthread_join attempted on a null thread
pointer!");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err("PThread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emsripten_main_browser_thread_id()==thread){err("Main thread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err("pthread_join attempted on thread
\"+thread+\", which does not point to a valid thread, or does not exist anymore!");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("Attempted to join thread
\"+thread+\", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emsripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus===1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}_pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emsripten_main_thre
ad_process_queued_calls();_emsripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}}function _pthread_join(thread,status){return __emsripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emsripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator==="object")return navigator["hardwareConcurrency"]||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emsripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_w
rite,_sysconf];var
asmLibraryArg={"e":__assert_fail,"r":__call_main,"x":__emsripten_notify_thread_queue,"b":_abort,"y":
_emsripten_asm_const_int,"j":_emsripten_conditional_set_current_thread_status,"d":_emsripten_futex_wait,\
"c":_emsripten_futex_wake,"f":_emsripten_get_now,"p":_emsripten_memcpy_big,"A":_emsripten_num_l
ogical_cores,"u":_emsripten_receive_on_main_thread_js,"q":_emsripten_resize_heap,"v":_emsripten_set_ca
nvas_element_size,"i":_emsripten_set_current_thread_status,"s":_emsripten_set_thread_name,"w":_emscript
en_webgl_create_context,"l":_fd_close,"n":_fd_seek,"g":_fd_write,"o":initPthreadsJS,"a":wasmMemory||Mo
dule["wasmMemory"],"z":_pthread_cleanup_pop,"k":_pthread_cleanup_push,"h":_pthread_create,"m":_pthr

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ead_join,\"t\":_sysconf});var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap
ply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"
asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).app
ly(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments
)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,argu
ments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]
=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).a
pply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=M

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odule["asm\"][["Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["asm\"][["_"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["asm\"][["$"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["asm\"][["aa"]]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["asm\"][["ba"]]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["asm\"][["ca"]]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["asm\"][["da"]]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["asm\"][["ea"]]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["asm\"][["fa"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["asm\"][["ga"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["asm\"][["ha"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["asm\"][["ia"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["asm\"][["ja"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["asm\"][["ka"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["asm\"][["la"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["asm\"][["ma"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["asm\"][["na"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["asm\"][["oa"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["asm\"][["pa"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["asm\"][["qa"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["asm\"][["ra"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["asm\"][["sa"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["asm\"][["ta"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["asm\"][["ua"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["asm\"][["va"]]).apply(null,arguments)};

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ts});var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]["wa
").apply(null,arguments));var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"]["xa
a").apply(null,arguments));var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"]["ya").a
pply(null,arguments));var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"]["za").apply(null,argumen
ts));var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Mod
ule["_NonMaxSuppressionV3"]=Module["asm"]["Aa").apply(null,arguments));var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Mod
ule["_NonMaxSuppressionV4"]=Module["asm"]["Ba").apply(null,arguments));var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Mod
ule["_NonMaxSuppressionV5"]=Module["asm"]["Ca").apply(null,arguments));var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"]["Da
").apply(null,arguments));var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"]["Ea").appl
y(null,arguments));var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"]["Fa").apply(nu
ll,arguments));var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"]["Ga").apply(null,argume
nts));var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"]["Ha").apply(nu
ll,arguments));var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"]["Ia").apply(nu
ll,arguments));var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"]["Ja").app
ly(null,arguments));var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"]["Ka").apply(nu
ll,arguments));var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"]["La").apply(nu
ll,arguments));var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Mo
dule["asm"]["Ma").apply(null,arguments));var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"]["Na").app
ly(null,arguments));var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["asm"]["Oa").apply(null,arguments));var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"]["Pa").apply(nu
ll,arguments));var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"]["Qa").apply(nu
ll,arguments));var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"]["Ra
").apply(null,arguments));var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"]["Sa").
apply(null,arguments));var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"]["Ta").app

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ply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"]["Ua"]).apply(null,arguments)
};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Va"]).a
pply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Wa"]).apply(null,argume
nts)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Xa"]).apply(n
ull,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"]["Ya"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Za"]).apply(null,argume
nts)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"]["_a"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["$a"]).apply(null,argument
s)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["ab"]).apply(null,argume
nts)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["bb"]).apply(null,argument
s)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["cb"]).apply(null,argu
ments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["db"]).apply(null,argument
s)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["eb"]).apply(null,ar
guments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["fb
b"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["gb
b"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"]["hb"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["ib"]).apply(nul
l,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["jb"]).apply(null,arguments
)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"]["kb"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global
_libc=Module["_emscripten_get_global_libc"]=Module["asm"]["lb"]).apply(null,arguments)};var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["as
m"]["mb"]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=M
odule["__pthread_tsd_run_dtors"]=Module["asm"]["nb"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_que
ued_calls"]=Module["asm"]["ob"]).apply(null,arguments)};var

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_emsripten_current_thread_process_queued_calls=Module[\"_emsripten_current_thread_process_queued_calls\"]
=function(){return(_emsripten_current_thread_process_queued_calls=Module[\"_emsripten_current_thread_proc
ess_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emsripten_register_main_browser_thread_id=Module[\"_emsripten_register_main_browser_thread_id\"]=functi
on(){return(_emsripten_register_main_browser_thread_id=Module[\"_emsripten_register_main_browser_thread_
id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var
_emsripten_main_browser_thread_id=Module[\"_emsripten_main_browser_thread_id\"]=function(){return(_ems
cripten_main_browser_thread_id=Module[\"_emsripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments)};var
__emsripten_do_dispatch_to_thread=Module[\"__emsripten_do_dispatch_to_thread\"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module[\"__emsripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments)};var
_emsripten_sync_run_in_main_thread_4=Module[\"_emsripten_sync_run_in_main_thread_4\"]=function(){retur
n(_emsripten_sync_run_in_main_thread_4=Module[\"_emsripten_sync_run_in_main_thread_4\"]=Module[\"asm\
\"][\"tb\"]).apply(null,arguments)};var
_emsripten_run_in_main_runtime_thread_js=Module[\"_emsripten_run_in_main_runtime_thread_js\"]=function(
){return(_emsripten_run_in_main_runtime_thread_js=Module[\"_emsripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emsripten_call_on_thread=Module[\"__emsripten_call_on_thread\"]=function(){return(__emsripten_call_on_t
hread=Module[\"__emsripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emsripten_tls_init=Module[\"_emsripten_tls_init\"]=function(){return(_emsripten_tls_init=Module[\"_emscrip
ten_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emsripten_thread_init=Module[\"__emsripten_thread_init\"]=function(){return(__emsripten_thread_init=Mod
ule[\"__emsripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\
\"][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\
\"]).apply(null,arguments)};var
_emsripten_stack_set_limits=Module[\"_emsripten_stack_set_limits\"]=function(){return(_emsripten_stack_set_
limits=Module[\"_emsripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb
\"]).apply(null,arguments)};var
__emsripten_allow_main_runtime_queued_calls=Module[\"__emsripten_allow_main_runtime_queued_calls\"]=1
0512;var
__emsripten_main_thread_futex=Module[\"__emsripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"])Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo

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dule["setStatus"]("\\"),1);doRun(),1)}else{doRun()}}Module["run"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({"cmd":"exitProcess","returnCode":status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module["onExit"])Module["onExit"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module["preInit"]){if(typeof
Module["preInit"]!="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n);}\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports["WasmBackendModuleThreadedSimd"] =
WasmBackendModuleThreadedSimd;\n", "export const wasmWorkerContents = 'var Module={};function
threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(" ");console.error(text)}function
threadAlert(){var text=Array.prototype.slice.call(arguments).join("
");postMessage({cmd:"alert",text:text,threadId:Module["_pthread_self"]})}}var
err=threadPrintErr;this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd==="load"){Module["wasmModule"]=e.data.wa
smModule;Module["wasmMemory"]=e.data.wasmMemory;Module["buffer"]=Module["wasmMemory"].buffer;
Module["ENVIRONMENT_IS_PTHREAD"]=true;if(typeof
e.data.urlOrBlob==="string"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
if(e.data.cmd==="objectTransfer"){Module["PThread"].receiveObjectTransfer(e.data)}else
if(e.data.cmd==="run"){Module["__performance_now_clock_drift"]=performance.now()-
e.data.time;Module["__emscripten_thread_init"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module["establishStackSpace"](top,max);Module["__emscripten_tls_init"](
);Module["PThread"].receiveObjectTransfer(e.data);Module["PThread"].setThreadStatus(Module["_pthread_self
"],1);try{var
result=Module["invokeEntryPoint"](e.data.start_routine,e.data.arg);if(!Module["getNoExitRuntime"]())Module[
"PThread"].threadExit(result)}catch(ex){if(ex==="Canceled!"){Module["PThread"].threadCancel()}else
if(ex!="unwind"){if(ex instanceof
Module["ExitStatus"]){if(Module["getNoExitRuntime"]()){}else{Module["PThread"].threadExit(ex.status)}}el
se{Module["PThread"].threadExit(-2);throw ex}}}}else
if(e.data.cmd==="cancel"){if(Module["_pthread_self"]){Module["PThread"].threadCancel()}}else
if(e.data.target==="setimmediate"){}}else
if(e.data.cmd==="processThreadQueue"){if(Module["_pthread_self"]){Module["__emscripten_current_thread_
process_queued_calls"]()}else{err("worker.js received unknown command
"+e.data.cmd);err(e.data)}}catch(ex){err("worker.js onmessage() captured an uncaught exception:
"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process==="object"&&typeof
process.versions==="object"&&typeof process.versions.node==="string"){self={location:{href:__filename}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require("worker_threads");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on("message",function(data){onmessage({data:data}});var
nodeFS=require("fs");var nodeRead=function(filename){return nodeFS.readFileSync(filename,"utf8")};function

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globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEval(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof performance===undefined){performance={now:function(){return Date.now()}}};"\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof WasmBackendModule!=="undefined"?WasmBackendModule:{};var readyPromiseResolve,readyPromiseReject;Module["ready"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram= "./this.program";var quit_=function(status,toThrow){throw toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window==="object";ENVIRONMENT_IS_WORKER=typeof importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof process.versions==="object"&&typeof process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory="";function locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").dirname(scriptDirectory)+"\\"}else{scriptDirectory=__dirname+"\\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=nodePath["normalize"](filename);return nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"\\");arguments_=process["argv"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["inspect"]=function(){return "[Emscripten Module object]"}else if(ENVIRONMENT_IS_SHELL){if(typeof read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer==="function"){return new Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof arguments!="undefined"){arguments_=arguments}if(typeof quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof console==="undefined")console={};console.log=print;console.warn=console.error=typeof printErr!="undefined"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!=="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src;if(_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf("\\")+1)}else{scriptDirectory=""}}read_=function(url){var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new

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Uint8Array(xhr.response)} }readAsync=function(url,onload,onerror){ var xhr=new
XMLHttpRequest;xhr.open("\GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return }onerror();}xhr.onerror=onerror;xhr.send(null)
}setWindowTitle=function(title){ document.title=title } else { var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} } moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!="object"){abort("no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){ var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func }function ccall(ident,returnType,argTypes,args,opts){ var toC={"string":function(str){ var
ret=0;if(str!=null&&str!=undefined&&str==0){ var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len) }return ret}, "array":function(arr){ var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret }};function
convertReturnValue(ret){if(returnType=="string")return UTF8ToString(ret);if(returnType=="boolean")return
Boolean(ret);return ret} var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){ var
converter=toC[argTypes[i]];if(converter){if(stack==0)stack=stackSave();cArgs[i]=converter(args[i])}else {cArgs[i
]=args[i] }} var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!=0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){ argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type=="number"});var
numericRet=returnType!="string";if(numericRet&&numericArgs&&!opts){ return getCFunc(ident) }return
function(){ return ccall(ident,returnType,argTypes,arguments,opts) }} var UTF8Decoder=typeof
TextDecoder!="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){ var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){ return UTF8Decoder.decode(heap.subarray(idx,endPtr)) } else { var
str="";while(idx<endPtr){ var u0=heap[idx++];if(!(u0&128)){ str+=String.fromCharCode(u0);continue } var
u1=heap[idx++]&63;if((u0&224)==192){ str+=String.fromCharCode((u0&31)<<6|u1);continue } var
u2=heap[idx++]&63;if((u0&240)==224){ u0=(u0&15)<<12|u1<<6|u2 } else { u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63 } if(u0<65536){ str+=String.fromCharCode(u0) } else { var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023) }} } return str }function
UTF8ToString(ptr,maxBytesToRead){ return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):"" }function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){ var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023) }if(u<=127){ if(outIdx>=endIdx)break;heap[outIdx++]
=u } else if(u<=2047){ if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63 } else
if(u<=65535){ if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63 } else { if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63 } } heap[outIdx]=0;return outIdx-startIdx }function
stringToUTF8(str,outPtr,maxBytesToWrite){ return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite) }function

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writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"]((runDependencies))}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]((runDependencies))}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort(\n"+what+"\n). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)}))}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var

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exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"][j];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"][r];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"]);function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(Promise.reject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===function){callback(Module);continue}var func=callback.func;if(typeof
func===number){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iiovcnt,pnum){var num=0;for(var
i=0;i<iiovcnt;i++){var ptr=HEAP32[iiov+i*8>>2];var len=HEAP32[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _pthread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case

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131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]|1;return 1 }setErrNo(28);return-1 }var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).app
ly(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[
\"asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments
)};var

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_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm\"][["F"]]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm\"][["G"]]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm\"][["H"]]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm\"][["I"]]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm\"][["J"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm\"][["K"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm\"][["L"]]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm\"][["M"]]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm\"][["N"]]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm\"][["O"]]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm\"][["P"]]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm\"][["Q"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm\"][["R"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm\"][["S"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm\"][["T"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm\"][["U"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm\"][["V"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm\"][["W"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm\"][["X"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm\"][["Y"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm\"][["Z"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm\"][["_"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm\"][["$"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm\"][["aa"]]).apply(null,arguments)};var

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_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["ba"]]).
apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["c
a"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["da"]]).apply(null,ar
guments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["ea"]]).apply(null,argumen
ts)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["fa
"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["g
a"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ha"]]).a
pply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["ia"]]).apply(null,argument
s)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Mod
ule["_NonMaxSuppressionV3"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Mod
ule["_NonMaxSuppressionV4"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Mod
ule["_NonMaxSuppressionV5"]=Module["asm"][["la"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["ma"
])}.apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["na"]]).appl
y(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["oa"]]).apply(nul
l,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["pa"]]).apply(null,argume
nts)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["qa"]]).apply(null,argu
ments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["ra"]]).apply(null,argum
ents)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["sa"]]).app
ly(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["ta"]]).apply(null,argume
nts)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,ar
guments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Mo
dule["asm"][["va"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).app
ly(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(nul
l,arguments)};var

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_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Ea"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ha"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["La"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["Va"]]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["Wa"]]).apply(null,arguments)};var

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memoryOffset);\n\n if (values != null) {\n   this.wasm.HEAPU8.set(\n     new Uint8Array(\n       (values\n       as backend_util.TypedArray).buffer,\n       (values as backend_util.TypedArray).byteOffset, numBytes),\n     memoryOffset);\n   }\n }\n\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n   return\n   this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n   const {memoryOffset,\n   dtype, shape, stringBytes} =\n     this.dataIdMap.get(dataId);\n   if (dtype === 'string') {\n     return stringBytes;\n   }\n   const bytes = this.wasm.HEAPU8.slice(\n     memoryOffset,\n     memoryOffset +\n     util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n   return typedArrayFromBuffer(bytes.buffer, dtype);\n }\n\n /**\n  * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n  * is released, false\n  * otherwise.\n  * @param dataId\n  * @param force Optional, remove the data regardless of refCount\n  */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data =\n        this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n      this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData =\n        this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision():\n  32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable:\n    false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this\n   * method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated\n   * elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape:\n  number[], dtype: DataType, memoryOffset?: number):\n  TensorInfo {\n    let dataId: {};\n    if (memoryOffset\n    == null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id =\n        this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,\n      refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size,\n      memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}:\n  TensorInfo):\n  backend_util.TypedArray {\n    const buffer = this.wasm.HEAPU8.buffer;\n    const\n    {memoryOffset} = this.dataIdMap.get(dataId);\n    const size = util.sizeFromShape(shape);\n    switch (dtype) {\n    case 'float32':\n      return new Float32Array(buffer, memoryOffset, size);\n    case 'int32':\n      return new\n      Int32Array(buffer, memoryOffset, size);\n    case 'bool':\n      return new Uint8Array(buffer, memoryOffset,\n      size);\n    default:\n      throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n\n  function\n  createInstantiateWasmFunc(path: string) {\n    // this will be replace by rollup plugin patchWechatWebAssembly in\n    // miniprogram's output.\n    // tslint:disable-next-line:no-any\n    return (imports: any, callback: any) => {\n      util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n        if (!response['ok']) {\n          imports.env.a(`failed to load wasm binary file at '${path}'`);\n        }\n        response.arrayBuffer().then(binary => {\n          WebAssembly.instantiate(binary, imports).then(output => {\n            callback(output.instance, output.module);\n          });\n        });\n      });\n      return {};;\n    });\n  }\n\n  /**\n   * Returns the path of the WASM binary.\n   * @param\n   * simdSupported whether SIMD is supported\n   * @param threadsSupported whether multithreading is supported\n   * @param wasmModuleFolder the directory containing the WASM binaries.\n   */\n  function getPathToWasmBinary(\n  simdSupported: boolean, threadsSupported: boolean,\n  wasmModuleFolder: string) {\n    if (wasmPath != null) {\n      // If wasmPath is defined, the user has supplied a full path to\n      // the vanilla .wasm binary.\n      return\n      wasmPath;\n    }\n    let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n    if (simdSupported &&\n    threadsSupported) {\n      path = 'tfjs-backend-wasm-threaded-simd.wasm';\n    } else if (simdSupported) {\n      path =\n      'tfjs-backend-wasm-simd.wasm';\n    }\n    if (wasmFileMap != null) {\n      if (wasmFileMap[path] != null) {\n        return\n        wasmFileMap[path];\n      }\n    }\n    return wasmModuleFolder + path;\n  }\n\n  /**\n   * Initializes the wasm\n   * module and creates the js <--> wasm bridge.\n   */\n  /**\n   * NOTE: We wrap the wasm module in a object with property

```



```

'wasm' instead of
 * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested
 * in Chrome 76).
 * ^/nextport async function init(): Promise<{wasm: BackendWasmModule}> {
 const
 [simdSupported, threadsSupported] = await Promise.all([
 env().getAsync('WASM_HAS_SIMD_SUPPORT'),
 env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')
]);
 return new Promise((resolve, reject) => {
 const factoryConfig: WasmFactoryConfig = {};
 /**
 * This function overrides the Emscripten
 module locateFile utility.
 * @param path The relative path to the file that needs to be loaded.
 * @param prefix The path to the main JavaScript file's directory.
 * ^/ factoryConfig.locateFile = (path, prefix) => {
 if (path.endsWith('.worker.js')) {
 const response = wasmWorkerContents;
 const blob = new
 Blob([response], {type: 'application/javascript'});
 return URL.createObjectURL(blob);
 }
 if (path.endsWith('.wasm')) {
 return getPathToWasmBinary(
 simdSupported as boolean,
 threadsSupported as boolean,
 wasmPathPrefix != null ? wasmPathPrefix : prefix);
 }
 return prefix
 + path;
 };
 // Use the instantiateWasm override when system fetch is not available.
 // Reference:
 // https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170
 if (customFetch) {
 factoryConfig.instantiateWasm =
 createInstantiateWasmFunc(getPathToWasmBinary(
 simdSupported as boolean, threadsSupported as
 boolean,
 wasmPathPrefix != null ? wasmPathPrefix : ''));
 let initialized = false;
 factoryConfig.onAbort = () => {
 if (initialized) {
 // Emscripten already called console.warn so no need to
 double log.
 return;
 }
 if (initAborted) {
 // Emscripten calls `onAbort` twice, resulting in double
 error
 // messages.
 return;
 }
 initAborted = true;
 const rejectMsg =
 'Make sure the
 server can serve the `.wasm` file relative to the ' +
 'bundled js file. For more details see
 https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';
 reject({message: rejectMsg});
 };
 let wasm: Promise<BackendWasmModule>;
 // If `wasmPath` has
 been defined we must initialize the vanilla module.
 if (threadsSupported && simdSupported && wasmPath ==
 null) {
 factoryConfig.mainScriptUrlOrBlob = new Blob([
 var WasmBackendModuleThreadedSimd =
 +
 wasmFactoryThreadedSimd.toString(),
 {type: 'text/javascript'}]);
 wasm =
 wasmFactoryThreadedSimd(factoryConfig);
 } else {
 // The wasmFactory works for both vanilla and SIMD
 binaries.
 wasm = wasmFactory(factoryConfig);
 }
 // The WASM module has been successfully
 created by the factory.
 // Any error will be caught by the onAbort callback defined above.
 wasm.then((module) => {
 initialized = true;
 initAborted = false;
 const voidReturnType: string =
 null;
 // Using the tfjs namespace to avoid conflict with emscripten's API.
 module.tfjs = {
 init:
 module.cwrap('init', null, []),
 initWithThreadCount:
 module.cwrap('init_with_threads_count', null,
 ['number']),
 getThreadCount: module.cwrap('get_threads_count', 'number', []),
 registerTensor:
 module.cwrap(
 'register_tensor', null,
 [
 'number', // id
 'number', // size
 'number', // memoryOffset
 ]),
 disposeData: module.cwrap('dispose_data', voidReturnType,
 ['number']),
 dispose: module.cwrap('dispose', voidReturnType, []),
 };
 resolve({wasm: module});
 });
 }
 }
 }
 function typedArrayFromBuffer(
 buffer: ArrayBuffer, dtype: DataType):
 backend_util.TypedArray {
 switch (dtype) {
 case 'float32':
 return new Float32Array(buffer);
 case 'int32':
 return new Int32Array(buffer);
 case 'bool':
 return new Uint8Array(buffer);
 default:
 throw new Error(`Unknown dtype ${dtype}`);
 }
 }
 const wasmBinaryNames = [
 'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',
 'tfjs-backend-wasm-threaded-simd.wasm'
] as const;
 type
 WasmBinaryName = typeof wasmBinaryNames[number];
 let wasmPath: string = null;
 let wasmPathPrefix:
 string = null;
 let wasmFileMap: {[key in WasmBinaryName]?: string} = {};
 let initAborted = false;
 let
 customFetch = false;
 /**
 * @deprecated Use `setWasmPaths` instead.
 * Sets the path to the `.wasm` file
 which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more
 details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch
 to download
 * the wasm file, default to false.
 * ^/
 * @doc {heading: 'Environment', namespace: 'wasm'}

```

```

*\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n    ' will be removed in a future release.);\n  if
(initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call ' +\n
    ' `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n  }\n  wasmPath = path;\n  customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * \n * `js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
`\n * \n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * - Note that this prefix will be used to load each binary (vanilla,\n *
SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n *
full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n * \n * @doc {heading:
'Environment', namespace: 'wasm'}\n *\nexport function setWasmPaths(\n  prefixOrFileMap: string | {[key in
WasmBinaryName]?: string},\n  usePlatformFetch = false): void {\n  if (initAborted) {\n    throw new Error(\n
'The WASM backend was already initialized. Make sure you call ' +\n    ' `setWasmPaths()` before you call
`tf.setBackend()` or ' +\n    ' `tf.ready()`);\n  }\n\n  if (typeof prefixOrFileMap === 'string') {\n    wasmPathPrefix
= prefixOrFileMap;\n  } else {\n    wasmFileMap = prefixOrFileMap;\n    const missingPaths =\n    wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n    if (missingPaths.length > 0) {\n    throw new
Error(\n      `There were no entries found for the following binaries: ` +\n      `${missingPaths.join(',')}. Please
either call setWasmPaths with a ` +\n      `map providing a path for each binary, or with a string indicating ` +\n
      `the directory where all the binaries can be found.`);\n    }\n  }\n\n  customFetch = usePlatformFetch;\n}\n\n/**
Used in unit tests. *\nexport function resetWasmPath(): void {\n  wasmPath = null;\n  wasmPathPrefix = null;\n
wasmFileMap = {};\n  customFetch = false;\n  initAborted = false;\n}\n\nlet threadsCount = -1;\nlet
actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n *
threadpool (default to the number of logical CPU cores).\n * \n * This must be called before calling
`tf.setBackend('wasm')`.\n *\nexport function setThreadsCount(numThreads: number) {\n  threadsCount =
numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n * \n * It is set after the
backend is initialized.\n *\nexport function getThreadsCount(): number {\n  if (actualThreadsCount === -1) {\n
throw new Error('WASM backend not initialized.);\n  }\n  return actualThreadsCount;\n}\n\n", "/*\n * @license See the
LICENSE file. *\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport
{version};\n", "/*\n * \n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
\n\n
=====\n
*\nimport './flags_wasm';\nimport {registerBackend} from '@tensorflow/tfjs-core';\nimport {BackendWasm,
init} from './backend_wasm';\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\nconst
WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n  const {wasm} = await init();\n  return new
BackendWasm(wasm);\n},\n  WASM_PRIORITY);\n", "names":["_FusedMatMul","util","Abs","backend_util","Add","AddN","Identity","setup",
"Transpose","All","Any","wasmFunc","ArgMax","AvgPool","Reshape","BatchMatMul","slice_util","buffer","sliceI
mplCPU","Slice","BatchToSpaceND","Cast","Ceil","ClipByValue","concatImplCPU","Concat","Conv2D","Conv2
DBackpropInput","Cos","Cosh","CropAndResize","Cumsum","DepthToSpace","DepthwiseConv2dNative","Elu","s

```

upportsFullBroadcast","Equal","Exp","ExpandDims","Fill","FlipLeftRight","Floor","FloorDiv","FusedBatchNorm",
"FusedConv2D","FusedDepthwiseConv2D","GatherNd","GatherV2","Greater","GreaterEqual","setupFunc","Leaky
Relu","Less","LessEqual","Log","LogicalAnd","Max","Maximum","MaxPool","Mean","Min","Minimum","Mirror
Pad","Multiply","Neg","NonMaxSuppressionV3","NonMaxSuppressionV4","NonMaxSuppressionV5","kernelFunc
","NotEqual","OneHot","OnesLike","Pack","PadV2","Pow","Prelu","Prod","rangeImplCPU","Range","RealDiv","R
elu","Relu6","ResizeBilinear","Reverse","RotateWithOffset","Round","Rsqrt","ScatterNd","Select","Sigmoid","Sin
","Softmax","SpaceToBatchND","SplitV","Sqrt","Square","SquaredDifference","Step","StridedSlice","Sub","Sum",
"Tan","Tanh","Tile","TopK","Transform","Unpack","ZerosLike","registerKernel","env","require\$\$0","require\$\$1",
"require\$\$2","global","require\$\$3","require\$\$4","tslib_1.__extends","DataStorage","engine","KernelBackend","wa
smFactoryThreadedSimd","wasmFactory","deprecationWarn","registerBackend"],"mappings":":;;;;;;;;;;;;;
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AQ,QAMnB;AAED;AACA,IAAY,iBAQX;AARD,WAAY,iBAAiB;IAC3B,6DAAU,CAAA;IACV,yDAAQ,CAA
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KAAK,CAAC,OAAoB;IACjC,eAAe,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAACA,qBAAY,EAAE,IAAI,a
AAa;QACIE,QAAQ;QACR,OAAO;QACP,QAAQ;QACR,QAAQ;QACR,OAAO;QACP,QAAQ;QACR,QAAQ;Q
ACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;KACT,CAAC,CAAC;A
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C,CAAC;KACpE;IAEM,IAAA,6BAAU,EAAE,6BAAU,EAAE,6BAAU,EAAE,qCAAc,CAAU;IACnE,IAAM,GA
AG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/
C,IAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,
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,KAAK,CAAC,MAAM,KAAK,CAAC,EAAE;YAC/B,MAAM,IAAI,KAAK,CACX,iDAAiD;iBACjD,UAAQ,QA
AQ,CAAC,KAAK,CAAC,MAAM,MAAG,CAAA,CAAC,CAAC;SACvC;QACD,MAAM,GAAG,QAAQ,CAAC,E
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SAAS,CAAC,GAAG,CAAC,sBAAsB,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC5D,IAAM,eAAe,GACjB,i
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AAQ,GAAG,UAAU,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,GAAG,CAAC,CAAC,KAAK,CAAC,C
AAC,CAAC,CAAC;IACtD,IAAM,QAAQ,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,CAAC;IAE5B,IA
AM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,QAAQ,EAAE,OAAO,EAAE,QAAQ,CAAC,EAAE,CAA
C,CAAC,KAAK,CAAC,CAAC;IACvE,IAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,
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AiB;IAC7C,UAAU,EAAEA,qBAAY;IACxB,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KAAK;IACbB,UAAU
,EAAE,gBAAoC;CACjD;;AC7GD;;;;;;;;;;;;;SAuBgB,uBAAuB,CACnC,UAAkB,EAAE,OAAkB;IACxC,IAAI,Q
AA6D,CAAC;IAEIE,SAAS,SAAS,CAAC,OAAoB;QACrC,QAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CA
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AAS,UAAU,CAAC,IAAiD;QAE5D,IAAA,sBAAO,EAAW,iBAAC,CAAU;QACpC,IAAM,GAAG,GAAG,OAAO,

CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QAC/C,IAAM,GAAG,G
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C;QAC5D,IAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAA
C,EAAE,CAAC;;QAGnD,IAAIC,aAAI,CAAC,aAAa,CAAC,GAAG,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;
YACvC,OAAO,GAAG,CAAC;SACZ;QAED,QAAQ,CAAC,GAAG,EAAE,QAAQ,CAAC,CAAC,CAAC,KAAK,
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;;;;;AAoBO,IAAM,SAAS,GAAiB,uBAAuB,CAACC,YAAG,CAAC;;ACpBnE;;;;;;;SAuBgB,wBAAwB,CAC
pC,UAAkB,EAAE,qBAA8B,EACID,KAAgB;IACIB,IAAI,QAGQ,CAAC;IAEb,SAAS,SAAS,CAAC,OAAoB;QA
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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.node.js.map

No license file was found, but licenses were detected in source scan.

```
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LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n
int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
```

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```

=====
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { FusableActivation } from
'/types';\n\nlet wasmFusedMatMul:\n  (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number,\n  biasId: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,\n  null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number', // activation\n    'number', // biasId\n    'number', // preluActivationWeightsId\n    'number', //\n    leakyreluAlpha\n    'number' // out_id\n  ]);\n\n  function fusedBatchMatMul(args: {\n    inputs:\n      _FusedMatMulInputs,\n    backend: BackendWasm,\n    attrs: _FusedMatMulAttrs\n  }) {\n    const { inputs, backend,\n    attrs } = args;\n    const { a, b, bias, preluActivationWeights } = inputs;\n\n    if (a.dtype !== 'float32' || b.dtype !==\n    'float32') {\n      throw new Error(\n        `_FusedMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;\n    const aId =\n    backend.dataIdMap.get(a.dataId).id;\n    const bId = backend.dataIdMap.get(b.dataId).id;\n\n    let biasId = 0;\n    if (bias !== null) {\n      const biasData = backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `_FusedMatMul only supports rank-1 bias but got ` +\n          `rank\n          ${biasData.shape.length}.`);\n      }\n      biasId = biasData.id;\n    }\n\n    const preluActivationWeightsId =\n    preluActivationWeights === null ?\n      0 : backend.dataIdMap.get(preluActivationWeights.dataId).id;\n    const\n    fusedActivation =\n      FusableActivation[activation as {} as keyof typeof FusableActivation];\n\n    if (fusedActivation === null) {\n      throw new Error(\n        `${activation} activation not yet supported for\n        FusedConv2D ` +\n        `in the wasm backend.`);\n    }\n\n    const leftDim = transposeA ? a.shape[2] : a.shape[1];\n    const rightDim = transposeB ? b.shape[1] : b.shape[2];\n    const batchDim = a.shape[0];\n\n    const out =\n    backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes = new Uint8Array(new\n    Int32Array(a.shape).buffer);\n    const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n    wasmFusedMatMul(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n      transposeA,\n      transposeB, fusedActivation, biasId, preluActivationWeightsId,\n      leakyreluAlpha || 0, outId);\n\n    return\n    out;\n  }\n\n  export const fusedMatMulConfig: KernelConfig = {\n    kernelName: _FusedMatMul,\n    backendName:\n    'wasm',\n    setupFunc: setup,\n    kernelFunc: fusedBatchMatMul as {} as KernelFunc\n  };
  }

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}

=====
*\n\nimport { DataType, KernelConfig, TensorInfo, UnaryInputs, util } from '@tensorflow/tfjs-core';\n\nimport\n  { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from './types';\n\nexport function\n  createUnaryKernelConfig(\n    kernelName: string, outType?: DataType): KernelConfig {\n    let wasmFunc: (xId:\n    number, dtype: number, outId: number) => void;\n\n    function setupFunc(backend: BackendWasm): void {\n      wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n        'number', // x_id\n        'number', // dtype\n  ]
}

```

```

'number', // out_id\n  ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n TensorInfo {\n  const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const\n  out = backend.makeOutput(x.shape, outType || x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, CppDType[x.dtype], outId);\n  return out;\n }\n\n return {kernelName, backendName: 'wasm',\n  setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n  compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *\n  =====\n\n *\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n  License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n  agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n  the specific language governing permissions and\n * limitations under the License.\n *\n  =====\n\n *\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-\n  core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nexport\n  function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:\n  DataType): KernelConfig {\n  let wasmFunc:\n  (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n  number,\n  bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n  void;\n\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /*\n  void */, [\n  'number', // a_id,\n  'array', // a_shape\n  'number', // a_shape.length\n  'number', // b_id\n  'array', // b_shape\n  'number', // b_shape.length\n  'number', // dtype\n  'number' // out_id\n  ]);\n  }\n\n  function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n  TensorInfo {\n    const {backend,\n  inputs} = args;\n    const {a, b} = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId =\n  backend.dataIdMap.get(b.dataId).id;\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape =\n  backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape,\n  outputType);\n\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return\n  out;\n    }\n\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes =\n  new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const kernelFunc = () => wasmFunc(\n  aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n  CppDType[a.dtype], outId);\n\n    // Currently only some float operations support full broadcast.\n    if\n  (supportsFullBroadcast && a.dtype === 'float32') {\n      kernelFunc();\n      return out;\n    }\n\n    const\n  aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims =\n  backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n  v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA &&\n  loopsOverAllOfB) {\n      kernelFunc();\n      return out;\n    } else {\n      throw new Error(\n  `Broadcasting\n  along outer dims is not yet `+\n  `supported for ${a.dtype} ${kernelName}.`);\n    }\n\n    return\n  {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n  use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n  =====

```

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```
=====  
*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n", /*\n * @license\n * Copyright 2019 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  
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```

```
=====  
*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport\n {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n ]);\n\nfunction addn(args: {inputs:\n TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CCppType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as { } as KernelFunc,\n};\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or\n agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS,\n WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for\n the specific language governing permissions and limitations under the License.
```

```
=====  
*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport\n {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function\n identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =\n args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\n identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as { } as\n KernelFunc,\n};\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing,\n software distributed under the License is distributed\n on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied. See the License for the specific language governing permissions and limitations under the\n License.
```



```
}
}
return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};
"/**
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 */
```

```
=====
*/
import {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
 '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
import {permuteAxesAndTranspose} from './kernel_utils';
let wasmAll: (xId: number, reduceSize: number, outId: number) => void;
function setup(backend: BackendWasm): void {
  wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);
}
function all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}): TensorInfo {
  const {backend, inputs, attrs} = args;
  const {axis, keepDims} = attrs;
  const {x} = inputs;
  const xId = backend.dataIdMap.get(x.dataId).id;
  let inputId = xId;
  let input = x;
  const {transposed, axes, originalAxes, inputWasTransposed} = permuteAxesAndTranspose(x, axis, backend);
  if (inputWasTransposed) {
    const transposedId = backend.dataIdMap.get(transposed.dataId).id;
    input = transposed;
    inputId = transposedId;
  }
  const inputRank = input.shape.length;
  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);
  const [outShape, reduceShape] = backend_util.computeOutAndReduceShapes(input.shape, axes);
  const reduceSize = util.sizeFromShape(reduceShape);
  const out = backend.makeOutput(outShape, x.dtype);
  if (util.sizeFromShape(input.shape) !== 0) {
    const outId = backend.dataIdMap.get(out.dataId).id;
    wasmAll(inputId, reduceSize, outId);
  }
  if (inputWasTransposed) {
    // dispose of the transposed tensor.
    backend.disposeData(transposed.dataId);
  }
  if (keepDims) {
    // reshape
    const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);
    out.shape = newShape;
  }
  return out;
}
export const allConfig: KernelConfig = {
  kernelName: All,
  backendName: 'wasm',
  setupFunc: setup,
  kernelFunc: all as {} as KernelFunc;
};
"/**
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 */
```

```
=====
*/
import {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
 '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
import {permuteAxesAndTranspose} from './kernel_utils';
let wasmAny: (xId: number, reduceSize: number, outId: number) => void;
function setup(backend: BackendWasm): void {
  wasmAny = backend.wasm.cwrap(Any, null /*void*/, ['number, number, number']);
}
function any(args: {backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs}): TensorInfo {
  const {backend, inputs, attrs} = args;
  const {axis, keepDims} = attrs;
  const {x} = inputs;
  const xId = backend.dataIdMap.get(x.dataId).id;
  let inputId = xId;
  let input = x;
  const {transposed, axes, originalAxes, inputWasTransposed} = permuteAxesAndTranspose(x, axis, backend);
  if (inputWasTransposed) {
    const transposedId = backend.dataIdMap.get(transposed.dataId).id;
    input = transposed;
    inputId = transposedId;
  }
  const inputRank = input.shape.length;
  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);
  const [outShape, reduceShape] = backend_util.computeOutAndReduceShapes(input.shape, axes);
  const reduceSize = util.sizeFromShape(reduceShape);
  const out = backend.makeOutput(outShape, x.dtype);
  if (util.sizeFromShape(input.shape) !== 0) {
    const outId = backend.dataIdMap.get(out.dataId).id;

```

```
wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: any as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\nlet wasmFunc: (\n xId: number, dtype: number, outerSize: number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n ]);\n\nfunction argmax(\n args: {\n inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs\n }) {\n const { backend, inputs, attrs } = args;\n const { axis } = attrs as {} as ArgMaxAttrs;\n const { x } = inputs as {} as ArgMaxInputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const { transposed, axes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out =\n backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport { AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nlet wasmAvgPool: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n ]);\n\nfunction avgPool(\n args: {\n inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs\n }) {\n const { inputs, attrs,
```

```

backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n
`wasm backend does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n
}\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n `was backend
only supports average pooling with dilation = [1, 1],` +\n ` got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc\n};\n", "/**\n * @license\n
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the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n args: {inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} =
inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape =
util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () =>
`new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n `shape must have the same number of
elements.`);\n\n // Backend needs to track refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n
return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n
kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as { } as KernelFunc\n};\n", "/**\n *
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=====\n
*\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n
bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n
'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n
'number' // out_id\n ]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend:
BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n
const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n

```

```

    `BatchMatMul for non non-float32 tensors not yet supported.`);
  }

  const aRank = a.shape.length;
  const bRank = b.shape.length;
  const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];
  const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];
  const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];
  const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];
  const outerDimsA = a.shape.slice(0, -2);
  const outerDimsB = b.shape.slice(0, -2);
  const batchDimA = util.sizeFromShape(outerDimsA);
  const batchDimB = util.sizeFromShape(outerDimsB);
  const batchDimsCompatible = batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;
  util.assert(
    aRank >= 2 && bRank >= 2 && batchDimsCompatible,
    () => `Error in matMul: the input batch dimensions must either be the same or at least one input batch dimension must be 1. Got input batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);
  const outShapeOuterDims = batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);
  const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);
  util.assert(
    innerShapeA === innerShapeB,
    () => `Error in matMul: inner shapes (${innerShapeA}) and (${innerShapeB}) of Tensors with shapes ${a.shape} and ${b.shape} and transposeA=${transposeA} and transposeB=${transposeB} must match.`);
  const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] : [batchDimA, outerShapeA, innerShapeA];
  const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] : [batchDimB, innerShapeB, outerShapeB];
  // The rest of the implementation is designed to operate on rank-3 tensors
  const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});
  const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});
  const a3dId = backend.dataIdMap.get(a3d.dataId).id;
  const b3dId = backend.dataIdMap.get(b3d.dataId).id;
  const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];
  const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];
  const batchDim = Math.max(batchDimA, batchDimB);
  const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);
  const outId = backend.dataIdMap.get(out.dataId).id;
  const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);
  const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);
  wasmBatchMatMul(a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes, b3d.shape.length, transposeA, transposeB, outId);
  backend.disposeData(a3d.dataId);
  backend.disposeData(b3d.dataId);
  out.shape = outShape;
  return out;
}

export const batchMatMulConfig: KernelConfig = {
  kernelName: BatchMatMul,
  backendName: 'wasm',
  setupFunc: setup,
  kernelFunc: batchMatMul as KernelFunc;
};

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 */
import { backend_util, buffer, Slice, slice_util, util } from '@tensorflow/tfjs-core';
import { assertNotComplex } from '../cpu_util';
export function sliceImpl(vals, begin, size, shape, dtype) {
  const isContinuous = slice_util.isSliceContinuous(shape, begin, size);
  const length = util.sizeFromShape(size);
  const xStrides = util.computeStrides(shape);
  if (isContinuous) {
    const flatOffset = slice_util.computeFlatOffset(begin, xStrides);
    if (dtype === 'string') {
      return vals.slice(flatOffset, flatOffset + length);
    }
    return vals.subarray(flatOffset, flatOffset + length);
  }
  const decodedData = dtype === 'string' ? backend_util.fromUint8ToStringArray(vals) : vals;
  const inBuf = buffer(shape, dtype, decodedData);
  const outBuf = buffer(size, dtype);
  for (let i = 0; i < outBuf.size; ++i) {
    const outLoc = outBuf.indexToLoc(i);
    const inLoc = outLoc.map((idx, j) => idx + begin[j]);
    outBuf.set(inBuf.get(...inLoc), ...outLoc);
  }
  if (dtype === 'string') {
    return backend_util.fromStringArrayToUint8(outBuf.values);
  }
  return outBuf.values;
}
export function slice(args) {
  const { inputs, backend, attrs } = args;
  const { x } = inputs;
  const { begin, size } = attrs;

```


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```
=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}\nfrom '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from\n '../kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:\nBackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] =\nslice_util.parseSliceParams(x, begin, size);\n\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,\nsize_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const\nxStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinuous)\n  {\n    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n    if (x.dtype === 'string') {\n      outData.stringBytes =\n        (xVals as Uint8Array[])\n          .slice(flatOffset, flatOffset +\nutil.sizeFromShape(size_));\n    } else {\n      const outVals = backend.typedArrayFromHeap(out);\n      outVals.set(\n        (xVals as TypedArray)\n          .subarray(flatOffset, flatOffset +\nutil.sizeFromShape(size_));\n    }\n\n    return out;\n  }\n\n  if (x.dtype === 'string') {\n    const res =\nsliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n    outData.stringBytes = res as Uint8Array[];\n    return\nout;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2)\n  {\n    slice2d(\n      xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n      size_ as\n[number, number]);\n  } else if (rank === 3) {\n    slice3d(\n      xVals as TypedArray, xStrides[0], xStrides[1],\noutVals,\n      begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4)\n  {\n    slice4d(\n      xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n      begin_ as [number,\nnumber, number, number],\n      size_ as [number, number, number, number]);\n  } else {\n    const res =\nsliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n    outVals.set(res);\n  }\n\n  return\nout;\n}\n\nfunction slice2d(\n  xVals: backend_util.TypedArray, xStride: number,\n  outVals:\nbackend_util.TypedArray, begin: [number, number],\n  size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI;\ni++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]),\noutOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n  xVals: backend_util.TypedArray, xStride1:\nnumber, xStride2: number,\n  outVals: backend_util.TypedArray, begin: [number, number, number],\n  size:\n[number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i <\nendI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n  xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n  xStride3:\nnumber, outVals: backend_util.TypedArray,\n  begin: [number, number, number, number],\n  size: [number,\nnumber, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK\n+ size[2];\n  const beginL = begin[3];\n\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++)\n    {\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +\nbeginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as { } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2021 Google LLC. All Rights\nReserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\nexcept in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\nsoftware\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\nOR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction batchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: BackendWasm,\n  attrs: BatchToSpaceNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape, crops} = attrs;\n\n  const prod = blockShape.reduce((a, b) => a * b);\n\n  const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted = backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords = backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize = backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n  const xReshaped = reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n  const xTransposed = transpose({inputs: {x: xReshaped}, backend, attrs: {perm: permuted}});\n  const xTransposedReshaped = reshape({inputs: {x: xTransposed}, backend, attrs: {shape: reshapedPermuted}});\n  const result = slice({inputs: {x: xTransposedReshaped}, backend, attrs: {begin: sliceBeginCoords, size: sliceSize}});\n\n  backend.disposeData(xReshaped.dataId);\n  backend.disposeData(xTransposed.dataId);\n  backend.disposeData(result.dataId);\n\n  return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n  args: {\n    inputs: CastInputs,\n    attrs: CastAttrs,\n    backend: BackendWasm\n  }):\n  TensorInfo {\n  const {inputs: {x}, attrs: {dtype}, backend} = args;\n  const out = backend.makeOutput(x.shape, dtype);\n  const inVals = backend.typedArrayFromHeap(x);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

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=====\n*\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
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the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport { ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =\n  backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number', // x_id\n    'number', // min\n    'number', //\n    max\n    'number' // out_id\n  ]);\n\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend:\n    BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =\n    backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId,\n    clipValueMin, clipValueMax, outId);\n    return out;\n  }\n\n  export const clipByValueConfig: KernelConfig = {\n    kernelName: ClipByValue,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: clip as {} as\n    KernelFunc\n  }; \n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the\n   * Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the\n   * License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing, software\n   * distributed under the License is distributed\n   * on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n   * implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the\n   * License.\n   */\n}
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=====\n\n*\n\nimport { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { concatImplCPU } from\n '../kernel_utils/shared';\n\nimport { identity } from './Identity';\n\nimport { reshape } from './Reshape';\n\nexport function\n concat(\n  args: {\n    inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs\n  }) {\n  const {inputs, backend}\n  = args;\n\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n  let outShape =\n  backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n  // Keep only non-empty tensors (ignore tensors\n  with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n\n  if ($inputs.length ===\n  1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n\n  const out = backend.makeOutput(outShape,\n  inputs[0].dtype);\n\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n\n  const shapes =\n  $inputs.map(t => t.shape);\n\n  backend_util.assertParamsConsistent(shapes, axis);\n\n  if ($inputs[0].dtype ===\n  'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-\n    dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors\n    // into a two-dimensional tensor by\n    collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n    // the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize =\n      util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({inputs: {x: t},\n      backend, attrs: {shape}});\n    });\n\n    const inputsValShapes = inputs2D.map(t => {\n      return {vals:\n      backend.readSync(t.dataId), shape: t.shape};\n    });\n\n    // Concat 2d tensors along axis=1.\n    outShape =\n    backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n\n    const simplyConcat =\n    inputs2D[0].shape[0] === 1;\n\n    const outVals = concatImplCPU(\n      inputsValShapes, outShape,\n      inputs[0].dtype,\n      simplyConcat) as string[];\n\n    const finalOutShape =\n    backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n    out.shape = finalOutShape;\n\n    const\n    outData = backend.dataIdMap.get(out.dataId);\n\n    outData.stringBytes =\n    backend_util.fromStringArrayToUint8(outVals);\n\n    inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n    return out;\n  }\n\n  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n\n  let sumInnerDims =\n  0;\n\n  const innerDims = $inputs.map(input => {\n    const innerDim = util.sizeFromShape(input.shape.slice(axis));\n    sumInnerDims += innerDim;\n    return innerDim;\n  });\n\n  const inVals = $inputs.map(input =>\n  backend.typedArrayFromHeap(input));\n\n  const outVals = backend.typedArrayFromHeap(out);\n\n  for (let b = 0; b <
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batchDim; b++) {\n  let outOffset = b * sumInnerDims;\n  for (let i = 0; i < inVals.length; i++) {\n    const innerDim = innerDims[i];\n    const inOffset = b * innerDim;\n    const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n    outVals.set(vals, outOffset);\n    outOffset += innerDim;\n  }\n}\nreturn out;\n}\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as {} as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype, simplyConcat) {\n  const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n  if (simplyConcat && dtype !== 'string') {\n    // Use built-in TypedArray.set() method for speed.\n    let offset = 0;\n    inputs.forEach(input => {\n      const size = util.sizeFromShape(input.shape);\n      outVals.set(input.vals, offset);\n      offset += size;\n    });\n  } else {\n    let colOffset = 0;\n    inputs.forEach(input => {\n      const decodedData = dtype === 'string' ?\n        backend_util.fromUint8ToStringArray(input.vals) :\n        input.vals;\n      let tIdx = 0;\n      for (let row = 0; row < input.shape[0]; ++row) {\n        const resIdx = row * outShape[1] + colOffset;\n        for (let col = 0; col < input.shape[1]; ++col) {\n          outVals[resIdx + col] = decodedData[tIdx++];\n        }\n        colOffset += input.shape[1];\n      }\n    });\n  }\n  return outVals;\n}\n\nsourceMappingURL=data:application/json;base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiaWoiQ29uY2F0X2ltcGwuanMiLCJzb3VyY2VSb290IjoiaWwic291cmNlcyI6WyYuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2t1bmQtY3B1L3NyYy9rZlJhZmVzL0NvbmlhZmV9pbXBsLnRzIl0sIm5hbWVzIjpbXSxibWVwcGluZ3MiOiJBQUFBQ0Zs7Ozs7Ozs7Ozs7Ozs7R0RFRzRtBQUVILE9BQU8sRUFBRyZQUFZLEVBQXVDEIBQUksRUFBRyZQUFNLFHVCCUUF1QixDQUFDO0FBRTIGLE1BQU0sVUFBVSxVQUFVLENBQ3RCLLE1BQXFELEVBQUUsUUFBA0IsRUFDEkUsS0FBZSxvFQUFFLFIBQXFCO0IBQ3hDLE1BQU0sT0FBT0YxHQUFHLEIBQUksQ0FBQyxPqkFBaUIsQ0FBQyxLQUFLLLEVBQUUsSUFBSxvDQUFDLGFBBQWESQ0FBQyxRQUFRLENBQUMsQ0FBQyxvDQUFDO0IBRTVLEIBQUksWUFBWSxJQUFJLEtBQUssS0FBSyxRQUFRLENBQUU7UUFDEdEMsa0RBQWtEO1FBQ2xeLEIBQUksTUFBTSxHQUFHLENBQUMsQ0FBQztRQUNmLE1BQU0sQ0FBQyxPQUFPLENBQUMsS0FBSyxvDQUFDLEVBQUU7WUFDckIsTUFBTSxJQUFJLEdBQUcsSUFBSxvDQUFDLGFBBQWESQ0FBQyxLQUFLLLENBQUMsS0FBSyxvDQUFDLENBQUM7WUFFNUMsT0FBc0IsQ0FBQyxHQUFHLENBQUMsS0FBSyxvDQUFDLEIBQWtCLEVBQUUsTUFBTSxvDQUFDLENBQUM7WUFDQUssTUFBTSxJQUFJLEIBQUksQ0FBQztRQUNqQixDQUFDLENBQUMsQ0FBQztLQUNKO1NBQU07UUFDTcXJQUFJLEFNBMsR0FBRyxvDQUFDLENBQUM7UUFFbEIsTUFBTSxvDQUFDLE9BQU8sQ0FBQyxLQUFLLLENBQUMsRUFBRtZQUYyQixNQUNLFdBBQVcsR0FBRyxvLQUFLLLEtBQUssUUFBUSxvDQUFDLENBQUM7Z0JBQ3BDLFIBQVksQ0FBQyxvZkFBc0IsQ0FBQyxLQUFLLLENBQUMsSUFBb0IsQ0FBQyxvDQUFDLENBQUM7Z0JBQ2pFLEtBQUssQ0FBQyxvJQUFRixDQUFDLE1BRTdCLEIBQUksSUFBSxvHQUFHLENBQUMsQ0FBQztZQUVILEtBQUssSUFBSxvHQUFHLEdBQUcsQ0FBQyxvFQUFFLEdBQUcsR0FBRyxvLQUFLLLENBQUMsS0FBSyxvDQUFDLENBQUMsQ0FBQyxvFQUFFLEVBQUUsR0FBRYxvFQUFFO2dCQUM3QyxvNQUNLE1BQU0sR0FBRyxvHQUFHLEdBQUcsUUFBUSxvDQUFDLENBQUMsQ0FBQyxvHQUFHLEFNBMsQ0FBQztRkFDN0MsS0FBSyxvJQUFJLEdBQUcsR0FBRyxvDQUFDLEVBQUUsR0FBRYxvHQUFHLEtBQUssQ0FBQyxvLQUFLLLENBQUMsQ0FBQyxvDQUFDLEVBQUUsRUFBRsHQUFHLEVBQUU7b0JBQ2ZdDLE9BQU8sQ0FBQyxvNQUNLEdBQUcsR0FBRyxvDQUFDLEdBQUcsV0FBVyxvDQUFDLEIBQUksRUFBRsHQUFHLENBQUM7aUJBQ2ZdDO2FBQ0Y7WUFFRCxvTUFTLEIBQUksS0FBSyxvDQUFDLEtBQUssQ0FBQyxvDQUFDLENBQUMsQ0FBQztRQUM5QixDQUFDLENBQUMsQ0FBQztLQUNKO0IBRUQsT0FBT0YxPQUFPLENBQUM7QUFDakIsQ0FBQyIsInNvdXJjZXNDd250ZW50IjpbIi8qKlxiIENvcGgxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEIEdvb2dsZSBMTEMuIEIEFsCBsSaWdodHMgUmVzZXJ2ZWQuXG4gKiBMaWNlbn
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dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number',
// outputChannels\n 'number', // outId\n ]);\n}\n\nfunction conv2d(\n  args: {inputs: Conv2DInputs, backend:
BackendWasm, attrs: Conv2DAttrs}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n
const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n
(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode, false,
$dataFormat);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const
padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom =
convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight =
convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type
=== 'SAME' ? 1 : 0;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend
Conv2D does not support dataFormat: ` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n  }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  wasmConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n    filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n    outputChannels, outId);\n  return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride:
number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n ]);\n}\n\nfunction conv2DBackpropInput(args: {\n  backend:
BackendWasm,\n  inputs: Conv2DBackpropInputInputs,\n  attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const {backend, inputs, attrs} = args;\n  const {dy, filter} = inputs;\n  const {strides, pad, dataFormat,
dimRoundingMode, inputShape} = attrs;\n\n  const dilations = 1;\n\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n

```

```

inputShape, filter.shape as [number, number, number, number], strides,\n  dilations, pad, dimRoundingMode,\n false /* depthwise */, $dataFormat);\n const {\n  batchSize,\n  filterHeight,\n  filterWidth,\n  inChannels,\n  inHeight,\n  inWidth,\n  outChannels,\n  outHeight,\n  outWidth,\n  strideHeight,\n  strideWidth\n } =\n convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -\n convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =\n util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,\n fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =\n isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const\n xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =\n isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const\n yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,\n 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =\n backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n  dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n  inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n  topPad, leftPad, fltS0, fltS1, fltS2,\n  xBatchStride, xRowStride,\n  xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n  yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n  kernelName: 'Conv2DBackpropInput',\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc:\n conv2DBackpropInput as { } as KernelFunc\n};\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *  
\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *  
\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n *  
\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,\n TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast }\n from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest\n = 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes:\n
```

```

number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number,
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n
'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n 'number',
// cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n 'number'
// out id\n ]);\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n
attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method,
extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n const numBoxes =
boxes.shape[0];\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =
[numBoxes, cropHeight, cropWidth, image.shape[3]];\n let imagesData =
backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData =
cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n imagesData =
backend.dataIdMap.get(castedData.dataId);\n }\n const imagesId = imagesData.id;\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n const
out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const
imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n
imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n
InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n extrapolationValue, outId);\n\n if
(castedData !== null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from
'./types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n finalDim: number, outId: number, dtype: CCppType) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n
'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n 'number' //
dtype\n ]);\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis,
exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis
to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n
if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n
const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n
backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n
const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n permutedOutId, CCppType[x.dtype]);\n\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs:

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{perm: undoPermutation}, backend});\n  backend.disposeData(permutedX.dataId);\n
backend.disposeData(permutedOut.dataId);\n } \n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n    'number', // xId\n    'number', // blockSize\n    'number', // channelsLast\n    'array', // xStrides\n
'number', // xStridesLength\n    'array', // outputShape\n    'array', // outputStrides\n    'number', // outSize\n
'number', // outId\n  ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs:
DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight
= (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ?
x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const
outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth =
inputDepth / (blockSize * blockSize);\n\n  const outputShape = (dataFormat === 'NHWC') ?\n    [batchSize,
outputHeight, outputWidth, outputDepth] :\n    [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const
out = backend.makeOutput(outputShape, 'float32');\n\n  const xData = backend.dataIdMap.get(x.dataId);\n  const
xId = xData.id;\n  const xStridesBytes =\n    new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n  const outStridesBytes =\n    new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  wasmDepthToSpace(\n    xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n    outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n  return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,
inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop:
number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight:
number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number,

```


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```
=====  
*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from  
 './unary_kernel';\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version  
 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
 copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable  
 law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
 the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====  
*\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from  
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from  
 './Reshape';\nexport function expandDims(args: {\n  inputs: ExpandDimsInputs,\n  attrs: ExpandDimsAttrs,\n  backend: BackendWasm\n}) {\n  const {inputs, attrs, backend} = args;\n  const {input} = inputs;\n  const {dim} =  
 attrs;\n\n  const inputRank = input.shape.length;\n  const newShape = input.shape.slice();\n  let $dim = dim;\n  if  
 (dim < 0) {\n    // Negative value is counted from the tail of rank.\n    util.assert(\n      -(inputRank + 1) <= dim,\n      () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n        inputRank\n      }]`);\n    $dim = inputRank + dim  
 + 1;\n  }\n  newShape.splice($dim, 0, 1);\n  return reshape({inputs: {x: input}, backend, attrs: {shape:  
 newShape}});\n}\nexport const expandDimsConfig: KernelConfig = {\n  kernelName: ExpandDims,\n  backendName: 'wasm',\n  kernelFunc: expandDims as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright  
 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,  
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
 governing permissions and\n * limitations under the License.\n *
```

```
=====  
*\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from  
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nexport function fill(args: {attrs:  
 FillAttrs, backend: BackendWasm}) {\n  const {attrs: {shape, value, dtype}, backend} = args;\n  const out =  
 backend.makeOutput(shape, dtype);\n  const outVals = backendtypedArrayFromHeap(out);\n  outVals.fill(value as  
 number);\n  return out;\n}\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName:  
 'wasm',\n  kernelFunc: fill as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All  
 Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this  
 file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,  
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
 governing permissions and\n * limitations under the License.\n *
```

```
=====  
*\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-  
 core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmFlipLeftRight: (\n  xId: number, batch:  
 number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>  
 void;\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,  

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null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', //
imageWidth\n 'number', // numChannels\n 'number', // outId\n ]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n
const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId =
backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch,
imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as { } as
KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n *
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LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet
wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number',
'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend:
BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =
inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =
backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId =

```

```

backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n    xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:
FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport { backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ FusibleActivation } from './types';\n\nlet wasmFusedConv2d: (\n    xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n    filterId: number, filterHeight: number, filterWidth: number,\n    biasId: number,
padTop: number, padRight: number, padBottom: number,\n    padLeft: number, isSamePad: number,
dilationHeight: number,\n    dilationWidth: number, strideHeight: number, strideWidth: number,\n    inputChannels: number, outputChannels: number, activation: number,\n    preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n    void;\n\nfunction setup(backend: BackendWasm) {\n
waswFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', // padRight\n
'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n
'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', //
inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n ]);\n\nfunction
fusedConv2d(args: {\n    inputs: FusedConv2DInputs,\n    backend: BackendWasm,\n    attrs: FusedConv2DAttrs\n})
{\n    const { inputs, attrs, backend } = args;\n    const { x, filter, bias, preluActivationWeights } = inputs;\n    const {\n
strides,\n    pad,\n    dilations,\n    dataFormat,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n    } =
attrs;\n\n    const convInfo = backend_util.computeConv2DInfo(\n        (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n        pad, dimRoundingMode);\n\n    const fusedActivation =\n        FusibleActivation[activation as { } as keyof typeof FusibleActivation];\n    if (fusedActivation == null) {\n        throw
new Error(\n            `${activation} activation not yet supported for FusedConv2D` +\n            `in the wasm backend.`);\n    }\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n    const outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n    if
(bias != null) {\n        const biasData = backend.dataIdMap.get(bias.dataId);\n        if (biasData.shape.length !== 1) {\n
throw new Error(\n            `FusedConv2D only supports rank-1 bias but got` +\n            `rank
${biasData.shape.length}`);\n        }\n        if (biasData.shape[0] !== outputChannels) {\n            throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not` +\n            `match the number of output channels
(${outputChannels})`);\n        }\n        biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const
filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight =
convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const
strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =
convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize =
convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if
(dataFormat !== 'NHWC') {\n        throw new Error(\n            `wasm backend FusedConv2D does not support
dataFormat:` +\n            `${dataFormat}`. Please use 'NHWC'.`);\n    }\n\n    const out =

```

```

backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n  xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n  biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n  dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n  fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
fusedConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport { backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nimport { FusibleActivation } from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n
filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n
backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\nfunction
fusedDepthwiseConv2d(args: {\n  inputs: FusedDepthwiseConv2DInputs,\n  backend: BackendWasm,\n  attrs:
FusedDepthwiseConv2DAttrs\n}) {\n  const { inputs, attrs, backend } = args;\n  const { x, filter, bias,
preluActivationWeights } = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n  const fusedActivation =\n    FusibleActivation[activation as {}
as keyof typeof FusibleActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n      `${activation}
activation not yet supported for FusedDepthwiseConv2D ` +\n      `in the wasm backend.`);\n  }\n\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const
outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n      `rank ${biasData.shape.length}.`);\n    }\n
if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n      `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n      `match the number of output channels (${outputChannels})`);\n    }\n
biasId = biasData.id;\n  }\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth =
convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const
padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =

```

```

convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n
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"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet
wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n
'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', //
sliceSize\n 'array', // strides\n 'number' // outId\n ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} =
inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params,
indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return
out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n
const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes,
outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n\n"/**\n * @license\n
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nimport {CppDType} from './types';\n\nlet
wasmGather:

```

```

(\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize:
number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'array',
// xStrides\n  'number', // stridesSize\n  'number', // indicesId\n  'number', // batchSize\n  'array', //
outStrides\n  'number' // outId\n  ]);\n}\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x,
indices} = inputs;\n  const {axis, batchDims} = attrs;\n\n  // Throw error when any index is out of bound.\n  const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n  const index
= indicesVals[i];\n  util.assert(\n    index <= axisDim - 1 && index >= 0,\n    () =>\n      `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]`);\n  }\n\n  const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n    x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n  const flattenX = reshape({\n    inputs: {x},\n    attrs: {\n      shape: [\n        shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n        shapeInfo.sliceSize\n      ]\n    },\n    backend\n  });\n  const
indicesSize = util.sizeFromShape(indices.shape);\n  const flattenIndex = reshape({\n    inputs: {x: indices},\n    attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n    backend\n  });\n  const flattenOutputShape =
[\n    shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n    shapeInfo.sliceSize\n  ];\n\n
const out = backend.makeOutput(flattenOutputShape, x.dtype);\n  if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n  }\n  const stridesSize = flattenX.shape.length - 1;\n\n  const xData =
backend.dataIdMap.get(flattenX.dataId);\n  const xId = xData.id;\n\n  const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n  const indicesId = indicesData.id;\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const xStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n  const outStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n  wasmGather(\n    xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n    shapeInfo.batchSize, outStridesBytes, outId);\n\n  backend.disposeData(flattenX.dataId);\n  backend.disposeData(flattenIndex.dataId);\n\n  // reshape\n  out.shape =
shapeInfo.outputShape;\n  return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n  kernelName:
GatherV2,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n", "/**\n
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n\n", "/**\n
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LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n\n", "/**\n
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```

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from\n './types';\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>\n void;\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu,\n    null /* void */, [\n      'number', // x_id\n      'number', // dtype\n      'number', // leakyrelu_alpha\n      'number', //\n      out_id\n    ]);\n}\nexport function leakyRelu(\n  args: \n    { inputs: LeakyReluInputs, attrs: LeakyReluAttrs,\n      backend: BackendWasm }):\n  TensorInfo {\n  const { inputs: { x }, attrs: { alpha }, backend } = args;\n  const xId =\n    backend.dataIdMap.get(x.dataId).id;\n  // According to TF API, LeakyRelu returns float32 when input is either\n  float32\n  // or int32.\n  const out = backend.makeOutput(x.shape, 'float32');\n  if (util.sizeFromShape(x.shape)\n    !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmFunc(xId, CppDType[x.dtype], alpha,\n      outId);\n  }\n  return out;\n}\nexport const leakyReluConfig: KernelConfig = {\n  kernelName: LeakyRelu,\n  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: leakyRelu as {} as KernelFunc,\n};\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Less } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig = \n  createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n", /*\n * @license\n * Copyright 2019 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, LessEqual } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig = \n  createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n", /*\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Log } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n", /*\n * @license\n * 
```


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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*/\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019  
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you  
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*/\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from  
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport  
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMax: (xId:  
number, dtype: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend:  
BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function max(args: {backend:  
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {reductionIndices, keepDims} = attrs;\n    const {x} = inputs;\n    const xId =  
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes,  
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      input = transposed;\n      inputId =  
transposedId;\n    }\n\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('max',  
axes, inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n    const reduceSize =  
util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n    if  
(util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmMax(inputId, CCppType[x.dtype], reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the  
transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const  
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    return out;\n  }\n\n  export const maxConfig: KernelConfig = {\n    kernelName: Max,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: max as {} as KernelFunc\n  };\n}/**\n * @license\n * Copyright 2019 Google  
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not  
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google
```

LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nlet wasmMaxPool: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args: { inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs }) {\n  const { inputs, attrs, backend } = args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  // TF API supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it because it uses xnnpack which only\n  // supports float32.\n  // Add the following assert only for the WASM backend instead of at core op\n  // level.\n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype === 'float32',\n    () =>\n      `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n  const { filterSize, strides, pad, dimRoundingMode } = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],\n    filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n    strideHeight, strideWidth, inputChannels, outputChannels, outId);\n  return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n  kernelName: MaxPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: maxPool\n} as KernelFunc;\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { cast } from './Cast';\nimport
```

```

{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n  backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n  args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs});\n  TensorInfo {\n    const {backend, inputs,
attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if
(inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId
!== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input =
transposed;\n        inputId = transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n      }\n    }\n\n    backend_util.assertAxesAreInnerMostDims(\n      'mean',
reductionAxes, input.shape.length);\n    const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize =
util.sizeFromShape(reduceShape);\n    let castedInput = input;\n    if (input.dtype !== 'float32') {\n      castedInput =\n      cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n      inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(outShape, 'float32');\n    if
(util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmMean(inputId, reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the transposed
tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    if (input.dtype
!== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n\n    return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: mean as {\n
as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n}\n\nfunction min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let
inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We
will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n    }\n\n    const inputRank = input.shape.length;\n\n    backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape,
axes);\n    const reduceSize = util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape,
input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId =
backend.dataIdMap.get(out.dataId).id;\n      wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n    }\n\n    if
(inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n

```

```

}\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n
kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\ncreateBinaryKernelConfig(Minimum, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-
paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n ]);\n}\n\nfunction
mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const
{inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /*
beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =
backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat =
paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const
postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes,
MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc:
setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====

```

```

*\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\ncreateBinaryKernelConfig(Multiply, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {BackendWasm} from './backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`\n\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the
shape equivalent to\n * `Result`\n * \n\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:
number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const
pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const
pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,
pValidOutputs};\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n  NonMaxSuppressionV3,\n  'number', // Result*\n  [\n    'number', // boxesId\n    'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', // scoreThreshold\n  ]);\n\n  function kernelFunc(args: {\n    backend: BackendWasm,\n    inputs: NonMaxSuppressionV3Inputs,\n    attrs: NonMaxSuppressionV3Attrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {iouThreshold,
maxOutputSize, scoreThreshold} = attrs;\n    const {boxes, scores} = inputs;\n\n    const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const
resOffset =\n      wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n    const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n      parseResultStruct(backend, resOffset);\n\n

```

```
// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor\n
=\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return\n
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:\n
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as { } as\n
KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *\n
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n
implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n
License.\n *
```

```
=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,\n
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from\n
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =\n
backend.wasm.cwrap(\n  NonMaxSuppressionV4,\n  'number', // Result*\n  [\n  'number', // boxesId\n
'number', // scoresId\n  'number', // maxOutputSize\n  'number', // iouThreshold\n  'number', //\n
scoreThreshold\n  'bool', // padToMaxOutputSize\n  ]);\n\nfunction nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n  inputs: NonMaxSuppressionV4Inputs,\n  attrs: NonMaxSuppressionV4Attrs\n});\n
TensorInfo[] {\n  const { backend, inputs, attrs } = args;\n  const { iouThreshold, maxOutputSize, scoreThreshold,\n
padToMaxOutputSize } =\n  attrs;\n  const { boxes, scores } = inputs;\n\n  const boxesId =\n
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const\n
resOffset = wasmFunc(\n  boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n  const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n
parseResultStruct(backend, resOffset);\n\n  // Since we are not using scores for V4, we have to delete it from the\n
heap.\n  backend.wasm._free(pSelectedScores);\n\n  const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  const validOutputsTensor =\n
backend.makeOutput([], 'int32', pValidOutputs);\n\n  return [selectedIndicesTensor,\n
validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:\n
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as { }\n
as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *\n
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n
implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n
License.\n *
```

```
=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,\n
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from\n
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
softNmsSigma: number) =>\n  number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =\n
backend.wasm.cwrap(\n  NonMaxSuppressionV5,\n  'number', // Result*\n  [\n  'number', // boxesId\n
'number', // scoresId\n  'number', // maxOutputSize\n  'number', // iouThreshold\n  'number', //\n
softNmsSigma\n  ]);\n\nfunction nonMaxSuppressionV5(args: {\n
backend: BackendWasm,\n  inputs: NonMaxSuppressionV5Inputs,\n  attrs: NonMaxSuppressionV5Attrs\n});\n
TensorInfo[] {\n  const { backend, inputs, attrs } = args;\n  const { iouThreshold, maxOutputSize, scoreThreshold,\n
softNmsSigma } =\n  attrs;\n  const { boxes, scores } = inputs;\n\n  const boxesId =\n
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const\n
resOffset = wasmFunc(\n  boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma);\n\n  const\n
{ pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n  parseResultStruct(backend, resOffset);\n\n  // Since we are not using scores for V5, we have to delete it from the\n
heap.\n  backend.wasm._free(pSelectedScores);\n\n  const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  const validOutputsTensor =\n
backend.makeOutput([], 'int32', pValidOutputs);\n\n  return [selectedIndicesTensor,\n
validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName:\n
NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV5 as { }\n
as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n
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License.\n *
```

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scoreThreshold\n    'number', // softNmsSigma\n    ]);\n\nfunction kernelFunc(args: {\n  backend:
BackendWasm,\n  inputs: NonMaxSuppressionV5Inputs,\n  attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[]
{\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma}
= attrs;\n  const {boxes, scores} = inputs;\n\n  const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n  const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const resOffset = wasmFunc(\n    boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n    softNmsSigma);\n\n  const {pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n\n  // Since we are not using
validOutputs for V5, we have to delete it from the\n  // heap.\n  backend.wasm._free(pValidOutputs);\n\n  const
selectedIndicesTensor =\n    backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n  const
selectedScoresTensor =\n    backend.makeOutput([selectedSize, 'float32', pSelectedScores);\n\n  return
[selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig =
{\n  kernelName: NonMaxSuppressionV5,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc
as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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=====\n
*/\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2020
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*/\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmOneHot: (\n  indicesId: number, depth:
number, onValue: number, offValue: number,\n  outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id\n
'number', // depth,\n    'number', // onValue\n    'number', // offValue\n    'number' // out_id\n  ]);\n}\n\nfunction
oneHot(\n  args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n  const {inputs,
backend, attrs} = args;\n  const {indices} = inputs;\n  const {depth, onValue, offValue} = attrs;\n\n  const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n  return out;\n}\n\nexport const oneHotConfig:
KernelConfig = {\n  kernelName: OneHot,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: oneHot as
{} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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=====
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const
onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as
{} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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=====
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {concat} from './Concat';\n\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n  args: {inputs: PackInputs, backend:
BackendWasm, attrs: PackAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {axis} =
attrs;\n\n    if (inputs.length === 1) {\n      return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n    }\n\n    const shape = inputs[0].shape;\n    const dtype = inputs[0].dtype;\n\n    inputs.forEach(t => {\n
util.assertShapesMatch(\n      shape, t.shape,\n      'All tensors passed to stack must have matching shapes');\n
util.assert(\n      dtype === t.dtype,\n      () => 'All tensors passed to stack must have matching dtypes');\n    });\n\n
const intermediateTensorInfos: TensorInfo[] = [];\n    const expandedTensors = inputs.map(t => {\n      const
expandedT =\n        expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n      intermediateTensorInfos.push(expandedT);\n      return expandedT;\n    });\n\n    const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n    intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n    return result;\n  }\n\nexport const packConfig: KernelConfig = {\n  kernelName:
Pack,\n  backendName: 'wasm',\n  kernelFunc: pack as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType}
from './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n
'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n
]);\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n  const outShape = paddings.map(\n    (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-
circuit the computation, since x doesn't have value, only\n    // the shape is used to compute output shape to pad.\n
return fill({\n    backend,\n    attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n  });\n  }\n\n  const
xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const

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outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n  new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n  new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n  xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n  postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} } as
KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { KernelConfig, Pow } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n  createBinaryKernelConfig(Pow, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*/\n\nimport { KernelConfig, KernelFunc, Prelu, PreluInputs } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from './backend_wasm';\n\nimport { cast } from './Cast';\n\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' //
out_id\n  ]);\n\n  function prelu(args: { inputs: PreluInputs, backend: BackendWasm }) {\n    const { inputs, backend
}
= args;\n    const { x, alpha } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if
(input.dtype !== 'float32') {\n      castedInput = cast({ backend, inputs: { x }, attrs: { dtype: 'float32' });\n      inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(x.shape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n\n    if (input.dtype
!== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n\n    return out;\n  }\n\n  export const preluConfig:
KernelConfig = {\n    kernelName: Prelu,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prelu as {} } as
KernelFunc\n  };\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmProd: (\n

```


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```
=====\n*\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\n  createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Relu } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport { KernelConfig, Relu6 } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', // oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', // newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n  function resizeBilinear(args: {\n    backend: BackendWasm,\n    inputs: ResizeBilinearInputs,\n    attrs: ResizeBilinearAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { images } = inputs;\n    const { alignCorners, halfPixelCenters, size } = attrs;\n    const [newHeight, newWidth] = size;\n    const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n    const outShape = [batch, newHeight, newWidth, numChannels];\n    let xData = backend.dataIdMap.get(images.dataId);\n    let castedData;\n    if (xData.dtype !== 'float32') {\n      castedData =\n        cast({ backend, inputs: { x: images }, attrs: { dtype: 'float32' }});\n      xData =\n
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backend.dataIdMap.get(castedData.dataId);\n }
const xId = xData.id;\n\n const out =
backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n  return out;\n }\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n  xId, batch, oldHeight,
oldWidth, numChannels, newHeight, newWidth,\n  alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if
(castedData != null) {\n  backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
resizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: resizeBilinear as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC.
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=====
*\n\nimport { KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { identity } from
'./Identity';\n\nimport { reshape } from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array,
axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n
'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n
'number', // out_id\n  ]);\n}\n\nexport function reverse(\n  args: { inputs: ReverseInputs, backend: BackendWasm, attrs:
ReverseAttrs }):\n  TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { dims } =
attrs;\n\n  const axes = util.parseAxisParam(dims, x.shape);\n\n  if (x.shape.length === 0) {\n  return
identity({ inputs: { x }, backend });\n  }\n\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const axesBytes =
new Uint8Array(new Int32Array(axes).buffer);\n  const outShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n  wasmReverse(\n    xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
outId);\n\n  const reshaped =\n    reshape({ inputs: { x: out }, attrs: { shape: x.shape }, backend });\n\n  backend.disposeData(out.dataId);\n  return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n
kernelName: Reverse,\n  backendName: 'wasm',\n  kernelFunc: reverse as { } as KernelFunc,\n  setupFunc:
setup\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport { KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,
TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { backend_util } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight:
number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n
fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n  'number', // xId\n  'number', //
batch\n  'number', // imageHeight\n  'number', // imageWidth\n  'number', // numChannels\n  'number', //
radians\n  'number', // centerX\n  'number', // centerY\n  'array', // fillBytes\n  'number', // fillLength\n
'number', // outId\n  ]);\n}\n\nexport function rotateWithOffset(args: { inputs: RotateWithOffsetInputs,\n
backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const { inputs, backend, attrs } =

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args;\n const { image } = inputs;\n const { radians, fillValue, center } = attrs;\n\n const out =
backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n const [centerX, centerY] =\n  backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n const fillValues =
typeof fillValue === 'number' ?\n  [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n  [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n  imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n  centerY,
fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup;\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\nimport { KernelConfig, Round } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'./unary_kernel';\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport { KernelConfig, Rsqrt } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'./unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util }
from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from
'./types';\n\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', //
sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n
'number' // outId\n  ]);\n\nfunction scatterNd(\n  args:\n    { backend: BackendWasm, inputs:
ScatterNdInputs, attrs: ScatterNdAttrs});\n  TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { indices,
updates } = inputs;\n    const { shape } = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if
(util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const { sliceRank, numUpdates, sliceSize, strides,
outputSize } =\n      scatter_util.calculateShapes(updates, indices, shape);\n\n    const indicesData =

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backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData =
backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize,
stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n
kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport { KernelConfig, KernelFunc, Select, SelectInputs, util } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number, eId: number,
offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n
'number', // offset\n 'number', // outId\n ]);\n\nfunction select(args: { inputs: SelectInputs, backend:
BackendWasm }) {\n const { inputs, backend } = args;\n const { condition, t, e } = inputs;\n\n const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 : \n
util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as { }
as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
void */, ['number', 'number']);\n\nfunction sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\n
TensorInfo {\n const { backend, inputs: { x } } = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out
= backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId,
outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as { } as KernelFunc\n};\n", "/*\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

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the specific language governing permissions and\n * limitations under the License.\n *

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=====\n\n*\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n
```

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=====\n\n*\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmFunc: (xId: number, outId:\n number, channels: number, batch: number) =>\n void;\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n 'number', // channels\n 'number' // batch\n ]);\n}\nfunction softmax(\n args: {backend: BackendWasm,\n inputs: SoftmaxInputs, attrs: SoftmaxAttrs}): \n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} =\n args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape,\n logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return\n out;\n}\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n", /**\n * @license\n * Copyright 2021 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n
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=====\n\n*\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,\n SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {padV2Config} from\n './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\nfunction\n spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs:\n SpaceToBatchNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,\n paddings} = attrs;\n const prod = util.sizeFromShape(blockShape);\n const completePaddings: Array<[number,\n number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n for (let i = 1 +\n blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n const paddedX =\n padV2Config.kernelFunc({\n inputs: {x},\n backend,\n attrs: {paddings: completePaddings, constantValue:\n 0}\n }) as TensorInfo;\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape,\n blockShape, prod, false);\n const permutedReshapedPaddedPermutation =\n backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n const reshapeInputs:\n ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n const\n paddedXReshaped =\n reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n const transposeInputs:\n TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n TransposeAttrs = {perm:\n permutedReshapedPaddedPermutation};\n const paddedXT =\n transpose({inputs: transposeInputs, backend,\n
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attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const
resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n  {inputs:
resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n
backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return
result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as { } as KernelFunc\n};\n"/**\n * @license\n *
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\nimport {slice} from './Slice';\n\nexport function splitV(\n  args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n  const
{numOrSizeSplits, axis} = attrs;\n\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n  const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n
const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] =
s;\n    const xSlice =\n      slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n    begin[$axis] += s;\n
return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName:
'wasm',\n  kernelFunc: splitV as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig
=\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\nfunction setup(backend:
BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n    'number', // x_id\n
'number', // alpha\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\nfunction step(\n  args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {alpha} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =
backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmStep(xId,
alpha, CCppType[x.dtype], outId);\n    return out;\n  }\n}\nexport const stepConfig: KernelConfig = {\n  kernelName:
Step,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: step as {} as KernelFunc\n};\n", "/*\n *
@license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from
'./Reshape';\nimport {slice} from './Slice';\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,
xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
'number', // xId\n    'array', // xStrides\n    'number', // xRank\n    'array', // beginBytes\n    'array', // endBytes\n
'array', // stridesBytes\n    'array', // outShapeBytes\n    'array', // outStridesBytes\n    'number', //
outShapeLength\n    'number', // outId\n  ]);\n}\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n
inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n
newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n
sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n
      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n      newAxisMask, shrinkAxisMask);\n\n  let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x},
backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is
memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have
rank at least 1, got: ${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n
// To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape:
finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out =

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backend.makeOutput(finalShapeSparse, 'float32');\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const
xStridesBytes =\n    new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n  const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);\n  const endBytes = new Uint8Array(new
Int32Array($end).buffer);\n  const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n  const
outputShapeBytes =\n    new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n  const outStridesBytes =
new Uint8Array(\n    new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmStridedSlice(\n    xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n    outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n  result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n  backend.disposeData(out.dataId);\n
}\n\n  return result;\n}\n\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as { } as KernelFunc\n};\n"/**\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

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*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n
'number', // reduce_size\n    'number', // dtype\n    'number', // out_id\n  ]);\n\n  function sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n    inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n
const\n    transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n
// transpose was\n    not a no-op. We will need to dispose of this\n    // once we are done.\n    input = transposed;\n
inputId =\n    transposedId;\n    reductionAxes = backend_util.getInnerMostAxes(\n      reductionAxes.length,\n
input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n    'sum', reductionAxes,\n
input.shape.length);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
waswSum(inputId, reduceSize, CppType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n
const

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newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n }\n\nreturn out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport\n {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet wasmTile: (\n  xId:\n  number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:\n  number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile =\n  backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', //\n    x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n  ]);\n}\n\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,\n  backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =\n  attrs;\n\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n    newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n  const out =\n  backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n  xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n  CCppType[out.dtype], outId);\n  return\n  out;\n}\n\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:\n  setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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*\n\nimport { KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number',
// x.shape.length\n  'number', // x.dtype\n  'number', // k\n  'bool', // sorted\n  'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n\nexport const topk:\n  (args: { inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs }) =>\n  TensorInfo[] | TensorInfo = ({ inputs, backend, attrs }) => {\n  const { x } = inputs;\n
const { k, sorted } = attrs;\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n  const outIndices =
backend.makeOutput(outputShape, 'int32');\n  const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n  wasmTopK(\n    xId, xShapeBytes, x.shape.length,
CppDType[x.dtype], k, sorted,\n    outValuesId, outIndicesId);\n\n  return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: topk as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util } from
 '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmTransform: (\n  imageId:
number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth:
number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n
stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,
null /*void*/, [\n  'number', // imageId\n  'number', // transformsId\n  'bool', // isBatchTransform\n  'number',
// batch\n  'number', // outHeight\n  'number', // outWidth\n  'number', // numChannels\n  'number', //
imageWidth\n  'number', // imageHeight\n  'array', // strides\n  'number', // stridesLength\n  'number', //
interpolationModeId\n  'number', // fillModeId\n  'number', // fillValue\n  'number' // outId\n
]);\n\nfunction transform(\n  args:\n  { backend: BackendWasm, inputs: TransformInputs, attrs:
TransformAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { image, transforms } = inputs;\n
const { interpolation, fillMode, fillValue, outputShape } = attrs;\n\n  const [batch, imageHeight, imageWidth,
numChannels] = image.shape;\n  const [outHeight, outWidth] =\n  outputShape != null ? outputShape :
[imageHeight, imageWidth];\n  const outShape =\n  [batch, outHeight, outWidth,\n  numChannels] as
[number, number, number, number];\n  const strides =\n  new Uint8Array(new
Int32Array(util.computeStrides(image.shape)).buffer);\n\n  const out = backend.makeOutput(outShape,
image.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const imageData =
backend.dataIdMap.get(image.dataId);\n  const imageId = imageData.id;\n\n  const transformsData =
backend.dataIdMap.get(transforms.dataId);\n  const transformsId = transformsData.id;\n\n  const
interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n  let fillModeId;\n  switch (fillMode) {\n  case
'constant':\n  fillModeId = 1;\n  break;\n  case 'reflect':\n  fillModeId = 2;\n  break;\n  case 'wrap':\n

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fillModeId = 3;\n  break;\n  case 'nearest':\n    fillModeId = 4;\n    break;\n  default:\n    fillModeId = 1;\n  break;\n }\n\n wasmTransform(\n  imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n  outWidth, numChannels, imageWidth, imageHeight, strides,\n  image.shape.length - 1, interpolationModeId,\n  fillModeId, fillValue,\n  outId);\n\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as { } as\n  KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

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*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from '@tensorflow/tfjs-core';\nimport\n{ BackendWasm } from './backend_wasm';\n\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend:\nBackendWasm }) {\n  const { inputs: { x }, backend } = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const\nzerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike\nas { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

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We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the\nlibrary. A modular build would replace\n// the contents of this file and import only the kernels that are\nneeded.\n\nimport { KernelConfig, registerKernel } from '@tensorflow/tfjs-core';\nimport { fusedMatMulConfig }\nfrom './kernels/_FusedMatMul';\nimport { absConfig } from './kernels/Abs';\nimport { addConfig } from\n './kernels/Add';\nimport { addNConfig } from './kernels/AddN';\nimport { allConfig } from './kernels/All';\nimport\n{ anyConfig } from './kernels/Any';\nimport { argMaxConfig } from './kernels/ArgMax';\nimport { avgPoolConfig }\nfrom './kernels/AvgPool';\nimport { batchMatMulConfig } from './kernels/BatchMatMul';\nimport\n{ batchToSpaceNDConfig } from './kernels/BatchToSpaceND';\nimport { castConfig } from './kernels/Cast';\nimport\n{ ceilConfig } from './kernels/Ceil';\nimport { clipByValueConfig } from './kernels/ClipByValue';\nimport\n{ concatConfig } from './kernels/Concat';\nimport { conv2DConfig } from './kernels/Conv2D';\nimport\n{ conv2DBackpropInputConfig } from './kernels/Conv2DBackpropInput';\nimport { cosConfig } from\n './kernels/Cos';\nimport { coshConfig } from './kernels/Cosh';\nimport { cropAndResizeConfig } from\n './kernels/CropAndResize';\nimport { cumsumConfig } from './kernels/Cumsum';\nimport { depthToSpaceConfig }\nfrom './kernels/DepthToSpace';\nimport { depthwiseConv2dNativeConfig } from\n './kernels/DepthwiseConv2dNative';\nimport { eluConfig } from './kernels/Elu';\nimport { equalConfig } from\n './kernels/Equal';\nimport { expConfig } from './kernels/Exp';\nimport { expandDimsConfig } from\n './kernels/ExpandDims';\nimport { fillConfig } from './kernels/Fill';\nimport { flipLeftRightConfig } from\n './kernels/FlipLeftRight';\nimport { floorConfig } from './kernels/Floor';\nimport { floorDivConfig } from\n './kernels/FloorDiv';\nimport { fusedBatchNormConfig } from './kernels/FusedBatchNorm';\nimport\n{ fusedConv2DConfig } from './kernels/FusedConv2D';\nimport { fusedDepthwiseConv2DConfig } from\n './kernels/FusedDepthwiseConv2D';\nimport { gatherNdConfig } from './kernels/GatherNd';\nimport\n{ gatherV2Config } from './kernels/GatherV2';\nimport { greaterConfig } from './kernels/Greater';\nimport

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{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
 './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
 './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
 './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
 './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
 './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
 './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
 './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
 './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  \n absConfig,\n  \n addConfig,\n  \n addNConfig,\n  \n allConfig,\n  \n anyConfig,\n
  \n argMaxConfig,\n  \n avgPoolConfig,\n  \n batchMatMulConfig,\n  \n batchToSpaceNDConfig,\n  \n castConfig,\n
  \n ceilConfig,\n  \n clipByValueConfig,\n  \n concatConfig,\n  \n conv2DConfig,\n  \n conv2DBackpropInputConfig,\n
  \n cosConfig,\n  \n coshConfig,\n  \n cropAndResizeConfig,\n  \n cumsumConfig,\n  \n depthToSpaceConfig,\n
  \n depthwiseConv2dNativeConfig,\n  \n eluConfig,\n  \n equalConfig,\n  \n expConfig,\n  \n expandDimsConfig,\n
  \n fillConfig,\n  \n flipLeftRightConfig,\n  \n floorConfig,\n  \n floorDivConfig,\n  \n fusedMatMulConfig,\n
  \n fusedBatchNormConfig,\n  \n fusedConv2DConfig,\n  \n fusedDepthwiseConv2DConfig,\n  \n gatherNdConfig,\n
  \n gatherV2Config,\n  \n greaterConfig,\n  \n greaterEqualConfig,\n  \n identityConfig,\n  \n leakyReluConfig,\n
  \n lessConfig,\n  \n lessEqualConfig,\n  \n logConfig,\n  \n logicalAndConfig,\n  \n maxConfig,\n  \n maximumConfig,\n
  \n maxPoolConfig,\n  \n meanConfig,\n  \n minConfig,\n  \n minimumConfig,\n  \n mirrorPadConfig,\n  \n multiplyConfig,\n
  \n negConfig,\n  \n nonMaxSuppressionV3Config,\n  \n nonMaxSuppressionV4Config,\n  \n nonMaxSuppressionV5Config,\n
  \n notEqualConfig,\n  \n oneHotConfig,\n  \n onesLikeConfig,\n  \n packConfig,\n  \n padV2Config,\n  \n powConfig,\n
  \n preluConfig,\n  \n prodConfig,\n  \n rangeConfig,\n  \n realDivConfig,\n  \n reluConfig,\n  \n relu6Config,\n
  \n reshapeConfig,\n  \n resizeBilinearConfig,\n  \n reverseConfig,\n  \n rotateWithOffsetConfig,\n  \n rsqrtConfig,\n
  \n roundConfig,\n  \n scatterNdConfig,\n  \n selectConfig,\n  \n sigmoidConfig,\n  \n sinConfig,\n  \n sliceConfig,\n
  \n softmaxConfig,\n  \n spaceToBatchNDConfig,\n  \n splitVConfig,\n  \n sqrtConfig,\n  \n squareConfig,\n
  \n squaredDifferenceConfig,\n  \n stepConfig,\n  \n stridedSliceConfig,\n  \n subConfig,\n  \n sumConfig,\n
  \n tanConfig,\n  \n tanhConfig,\n  \n tileConfig,\n  \n topKConfig,\n  \n transformConfig,\n  \n transposeConfig,\n
  \n unpackConfig,\n  \n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  \n registerKernel(kernelConfig);\n}\n\n", "/**\n *

```

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```
=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {slice} from\n './Slice';\nfunction unpack(\n  args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs});\nTensorInfo[] {\n  const {inputs, backend, attrs} = args;\n  const {value} = inputs;\n  let {axis} = attrs;\n  if (axis <\n  0) {\n    axis += value.shape.length;\n  }\n  const numOutputs = value.shape[axis];\n  const rank =\n  value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;\n  i++) {\n    if (i !== axis) {\n      outShape[outIndex++] = value.shape[i];\n    }\n  }\n  const outs: TensorInfo[] = new\n  Array(numOutputs);\n  const begin = new Array(rank).fill(0);\n  const size = value.shape.slice();\n  size[axis] = 1;\n  for (let i = 0; i < outs.length; i++) {\n    begin[axis] = i;\n    outs[i] = slice({inputs: {x: value}, attrs: {begin, size},\n  backend});\n  }\n  return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const\n  unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as {} as\n  KernelFunc,\n};\n\n\"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n  Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n  on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n  limitations under the\n  License.\n */\n\n=====\n\nimport {env} from '@tensorflow/tfjs-core';\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n  // This typed array\n  passed in to WebAssembly.validate is WebAssembly binary\n  // code. In this case it is a small program that\n  contains SIMD\n  // instructions.\n  'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new\n  Uint8Array([\n    0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n    2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,\n    11\n  ]));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-\n  feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n  //\n  TODO(annxingyuan): Enable node support once this is resolved.\n  //\n  https://github.com/tensorflow/tfjs/issues/3830\n  if (ENV.get('IS_NODE')) {\n    return false;\n  }\n  try {\n    //\n    Test for transferability of SABs (needed for Firefox)\n    //\n    https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n    new\n    MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n    // This typed array is a WebAssembly\n    program containing threaded\n    // instructions.\n    return WebAssembly.validate(new Uint8Array([\n    0, 97,\n    115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n    4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,\n    11\n  ]));\n  } catch (e) {\n    return false;\n  }\n});\n\n\"nvar WasmBackendModuleThreadedSimd = (function() {\n  var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :\n  undefined;\n  if (typeof __filename !== 'undefined') _scriptDir = __scriptDir || __filename;\n  return\n  (\nfunction(WasmBackendModuleThreadedSimd) {\n    WasmBackendModuleThreadedSimd =\n    WasmBackendModuleThreadedSimd || {};\n\nfunction\n  GROWABLE_HEAP_I8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}\n  return HEAP8}function\n  GROWABLE_HEAP_U8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
```



```

}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd: {};var
readyPromiseResolve,readyPromiseReject;Module[\'ready\']=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={ };var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.this.program\;var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module[\'ENVIRONMENT_IS_PTHREAD\']||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module[\'buffer\']}var scriptDirectory=\.\/;function
locateFile(path){if(Module[\'locateFile\']){return Module[\'locateFile\'](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\'path\').
dirname(scriptDirectory)+\'/\'}else{scriptDirectory=__dirname+\'/\'}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\'fs\');if(!nodePath)nodePath=require(\'path\');filename=
nodePath[\'normalize\'](filename);return
nodeFS[\'readFileSync\'](filename,binary?null:\'utf8\');}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\'argv\'].length>1){thisProgram=process[\'argv\'][1].replace(/\\/g,\'/\')}arguments_=process[\'arg
v\'].slice(2);process[\'on\'](\'uncaughtException\',function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\'on\'](\'unhandledRejection\',abort);quit_=function(status){process[\'exit\'](status)};Module[\'in
spect\']=function(){return\[Emscripten Module object\]};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\'worker_threads\')}catch(e){console.error(\'The
\'worker_threads\' module is not supported in this node.js build - perhaps a newer version is needed?);throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,\'binary\');assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={ };console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof

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_scriptDir !== "undefined" &&
_scriptDir){scriptDirectory=_scriptDir;if(scriptDirectory.indexOf("\blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("\")+1)}else{scriptDirectory=""}}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("\fs");if(!nodePath)nodePath=require("\path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:\utf8)};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("\perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("\no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("\Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,\Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str="";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-

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65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new
Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new
Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new
Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new
Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new
Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMem
ory=Module[\"wasmMemory\"]};buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=
Module[\"wasmMemory\"]}else{wasmMemory=new
WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad
memory\")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctor
s()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof
Module[\"preRun\"]!=\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){a
ddOnPreRun(Module[\"preRun\"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof
Module[\"postRun\"]!=\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].lengt
h){addOnPostRun(Module[\"postRun\"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function

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addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=nu
ll}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what+="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)}))}}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if!--numWorkersToLoad)removeRunDependency("wasm-
instantiate")})))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("wasm-instantiate")}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var

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exports=Module["instantiateWasm"](info,receiveInstance);return exports }catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false } }instantiateAsync().catch(readyPromiseReject);return{ } }var
ASM_CONSTS={10520:function(){throw"Canceled!"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback!="function"){callback(Module);continue }var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg
)}else{func(callback.arg===undefined?null:callback.arg)} } }var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EB
ADFD:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSIG:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
__emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1 } }var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw"Atomics.notify returned an unexpected value
"+ret}Module["_emscripten_futex_wake"]=__emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! killThread() can only ever be
called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
killThread!";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cancelThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cancelThread!";var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({"cmd":"cancel"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cleanupThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cleanupThread!";var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var

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worker=pthread.worker;PThread.returnWorkerToPool(worker)} } var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,1,ENVIRON
MENT_IS_WORKER,1);__emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\\":\\"exit\\"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\\":\\"cancelDone\\"})},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)} }PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e[\\data\\"];var
cmd=d[\\cmd\\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d[\\targetThread\\"]&&d[\\targetThread\\"]!=_pthread_self()){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\\transferList\\"])
}else{console.error('Internal error! Worker sent a message \''+cmd+'\" to target pthread '+d[\\targetThread\\"]+'\", but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\\"processQueuedMainThread
Work\\"){__emscripten_main_thread_process_queued_calls()}else
if(cmd===\\"spawnThread\\"){spawnThread(e.data)}else
if(cmd===\\"cleanupThread\\"){cleanupThread(d[\\thread\\"])
}else
if(cmd===\\"killThread\\"){killThread(d[\\thread\\"])
}else
if(cmd===\\"cancelThread\\"){cancelThread(d[\\thread\\"])
}else
if(cmd===\\"loaded\\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)

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{worker.runPthread();delete worker.runPthread}}else if(cmd===\`print\`){out(\`Thread \"+d[\`threadId\`]+\`:\`+d[\`text\`])}else if(cmd===\`printErr\`){err(\`Thread \"+d[\`threadId\`]+\`:\`+d[\`text\`])}else
if(cmd===\`alert\`){alert(\`Thread \"+d[\`threadId\`]+\`:\`+d[\`text\`])}else if(cmd===\`exit\`){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\`exitProcess\`){try{exit(d[\`returnCode\`])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\`cancelDone\`){PThread.returnWorkerToPool(worker)}else
if(cmd===\`objectTransfer\`){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\`setimmediate\`){worker.postMessage(e.data)}else{err(\`worker sent an unknown command
\`+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\`pthread sent
an error! \"+e.filename+\`:\`+e.lineno+\`:\`+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\`message\`,function(data){worker.onmessage({data:d
ata})});worker.on(\`error\`,function(data){worker.onerror(data)});worker.on(\`exit\`,function(data){})}worker.post
Message({\`cmd\`:\`load\`,\`urlOrBlob\`:\`Module[\`mainScriptUrlOrBlob\`]||_scriptDir,\`wasMemory\`:\`wasmMe
memory,\`wasModule\`:\`wasModule\`}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\`tfjs-
backend-wasm-threaded-simd.worker.js\`);PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length===0){PThread.allocateUnus
edWorker();PThread.loadWasModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\`establishStackSpace\`]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\`getNoExitRuntime\`]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasTable.get(ptr)(arg)}Module[\`invokeEntryPoint\`]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\`Assertion failed: \"+UTF8ToString(condition)+\`, at:
\`+[filename?UTF8ToString(filename):\`unknown filename\`,line,func?UTF8ToString(func):\`unknown
function\`])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\`hrtime\`]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\`__performance_now_clock_drift\`]}]}else if(typeof
dateNow!=="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId===mainThreadId){postMessag
e({\`cmd\`:\`processQueuedMainThreadWork\`})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\`targetThread\`:\`targetThreadId\`,\`cmd\`:\`processThreadQueue\`
})}else{var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return worker.postMessage({\`cmd\`:\`processThreadQueue\`})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\`timed-out\`)return-
73;if(ret===\`not-equal\`)return-6;if(ret===\`ok\`)return 0;throw\`Atomics.wait returned an unexpected value
\`+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var

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tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("\os").cpus().length;return
navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[b+i]>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListe
ners:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var

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i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){ var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return"";if(target==window)return"#window";
if(target==screen)return"#screen";return
target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas);GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!="\undefined"?document:0,typeof window!="\undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!="\undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var

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canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ex
t["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};
return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension("OES_vertex_array_object");if(ext){ctx["createVertexArray"]=function(){return
ext["createVertexArrayOES"]();ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension("WEBGL_draw_buffers");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffers
WEBGL"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("WEBGL_multi_dra
w"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source="";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault==="undefined"||webGLContextAttributes.enableExtensions

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ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)===\"\\\"){name=name.slice(0,name.lastIndexOf(\"\\\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+\"\\\"+j+\"\\\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=[\"default\", \"low-power\", \"high-performance\"];function
_emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_
I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iow,iocnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return

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_emsripten_proxy_to_main_thread_js(5,1,fd,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iovcnt+i*8>>2];var len=GROWABLE_HEAP_I32()[iovcnt+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j]);num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){ wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={ worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emsripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd":"run","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthr
ead=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer==="undefined"){err("Current
environment does not support SharedArrayBuffer, pthreads are not available!");return
6}if(!pthread_ptr){err("pthread_create called with a null thread pointer!");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emsripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var

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canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function
_emsripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\"Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function
__emsripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread
pointer!\");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread
\"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emsripten_main_browser_thread_id()==thread){err(\"Main thread
\"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread
\"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread
\"+thread+\", which was already detached!\");return
ERRNO_CODES.EINVAL}if(block){_emsripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({\"cmd\":_\"cleanupThread\",_\"thread\":_thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}_pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emsripten_main_thre
ad_process_queued_calls();_emsripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}}function _pthread_join(thread,status){return __emsripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emsripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emsripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emsripten_notify_thread_queue,\"b\":_abort,\"y\":
_emsripten_asm_const_int,\"j\":_emsripten_conditional_set_current_thread_status,\"d\":_emsripten_futex_wait,\"
c\":_emsripten_futex_wake,\"f\":_emsripten_get_now,\"p\":_emsripten_memcpy_big,\"A\":_emsripten_num_l
ogical_cores,\"u\":_emsripten_receive_on_main_thread_js,\"q\":_emsripten_resize_heap,\"v\":_emsripten_set_ca
nvas_element_size,\"i\":_emsripten_set_current_thread_status,\"s\":_emsripten_set_thread_name,\"w\":_emscript
en_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Mo

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dule["wasmMemory"],"z":_pthread_cleanup_pop,"k":_pthread_cleanup_push,"h":_pthread_create,"m":_pthread_join,"t":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module["__wasm_call_ctors"]=function(){return(__wasm_call_ctors=Module["__wasm_call_ctors"]=Module["asm"])[\"B\"]).apply(null,arguments)};var
_init=Module["_init"]=function(){return(_init=Module["_init"]=Module["asm"])[\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module["_init_with_threads_count"]=function(){return(_init_with_threads_count=Module["__wasm_call_ctors"]=Module["asm"])[\"D\"]).apply(null,arguments)};var
_get_threads_count=Module["_get_threads_count"]=function(){return(_get_threads_count=Module["_get_threads_count"]=Module["asm"])[\"E\"]).apply(null,arguments)};var
_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=Module["asm"])[\"F\"]).apply(null,arguments)};var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm"])[\"G\"]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm"])[\"H\"]).apply(null,arguments)};var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"])[\"J\"]).apply(null,arguments)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"])[\"K\"]).apply(null,arguments)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"])[\"L\"]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"])[\"M\"]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"])[\"N\"]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"])[\"O\"]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"])[\"P\"]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"])[\"Q\"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"])[\"R\"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"])[\"S\"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"])[\"T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["asm"])[\"U\"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"])[\"V\"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"])[\"W\"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["asm"])[\"X\"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"])[\"Y\"]).apply(null,arguments)};var

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_DeptHToSpace=Module["_DeptHToSpace"]=function(){return(_DeptHToSpace=Module["_DeptHToSpace"]=Module["asm"][_"Z"]).apply(null,arguments)};var
_DeptHwiseConv2dNative=Module["_DeptHwiseConv2dNative"]=function(){return(_DeptHwiseConv2dNative=Module["_DeptHwiseConv2dNative"]=Module["asm"][_"Z"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][_"$"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][_"aa"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][_"ba"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][_"da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][_"ga"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"][_"ha"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][_"ia"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][_"ja"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][_"ka"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][_"la"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][_"ma"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"na"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ta"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"ua"]).apply(null,arguments)};var

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_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"za"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][_"Aa"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][_"Ba"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][_"Ca"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][_"Da"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][_"Ea"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"Fa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"Ga"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"Ia"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"Ja"]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"Ka"]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][_"La"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][_"Ma"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][_"Na"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][_"Oa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][_"Pa"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][_"Qa"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][_"Ra"]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][_"Sa"]).apply(null,arguments)};var

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_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Va"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Xa"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ya"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Za"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["a"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["$a"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["fb"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["gb"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["kb"]]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=Module["asm"][["lb"]]).apply(null,arguments)};var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["asm"][["mb"]]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=function(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=Module["asm"][["ob"]]).apply(null,arguments)};var

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ued_calls"]=Module["asm"][["ob"]].apply(null,arguments);var
_emsripten_current_thread_process_queued_calls=Module["_emsripten_current_thread_process_queued_calls"]=function(){return(_emsripten_current_thread_process_queued_calls=Module["_emsripten_current_thread_process_queued_calls"]=Module["asm"][["pb"]].apply(null,arguments));var
_emsripten_register_main_browser_thread_id=Module["_emsripten_register_main_browser_thread_id"]=function(){return(_emsripten_register_main_browser_thread_id=Module["_emsripten_register_main_browser_thread_id"]=Module["asm"][["qb"]].apply(null,arguments));var
_emsripten_main_browser_thread_id=Module["_emsripten_main_browser_thread_id"]=function(){return(_emsripten_main_browser_thread_id=Module["_emsripten_main_browser_thread_id"]=Module["asm"][["rb"]].apply(null,arguments));var
__emsripten_do_dispatch_to_thread=Module["__emsripten_do_dispatch_to_thread"]=function(){return(__emsripten_do_dispatch_to_thread=Module["__emsripten_do_dispatch_to_thread"]=Module["asm"][["sb"]].apply(null,arguments));var
_emsripten_sync_run_in_main_thread_4=Module["_emsripten_sync_run_in_main_thread_4"]=function(){return(_emsripten_sync_run_in_main_thread_4=Module["_emsripten_sync_run_in_main_thread_4"]=Module["asm"][["tb"]].apply(null,arguments));var
_emsripten_run_in_main_runtime_thread_js=Module["_emsripten_run_in_main_runtime_thread_js"]=function(){return(_emsripten_run_in_main_runtime_thread_js=Module["_emsripten_run_in_main_runtime_thread_js"]=Module["asm"][["ub"]].apply(null,arguments));var
__emsripten_call_on_thread=Module["__emsripten_call_on_thread"]=function(){return(__emsripten_call_on_thread=Module["__emsripten_call_on_thread"]=Module["asm"][["vb"]].apply(null,arguments));var
_emsripten_tls_init=Module["_emsripten_tls_init"]=function(){return(_emsripten_tls_init=Module["_emsripten_tls_init"]=Module["asm"][["wb"]].apply(null,arguments));var
__emsripten_thread_init=Module["__emsripten_thread_init"]=function(){return(__emsripten_thread_init=Module["__emsripten_thread_init"]=Module["asm"][["xb"]].apply(null,arguments));var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["yb"]].apply(null,arguments));var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"][["zb"]].apply(null,arguments));var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ab"]].apply(null,arguments));var
_emsripten_stack_set_limits=Module["_emsripten_stack_set_limits"]=function(){return(_emsripten_stack_set_limits=Module["_emsripten_stack_set_limits"]=Module["asm"][["Bb"]].apply(null,arguments));var
_memalign=Module["_memalign"]=function(){return(_memalign=Module["_memalign"]=Module["asm"][["Cb"]].apply(null,arguments));var
__emsripten_allow_main_runtime_queued_calls=Module["__emsripten_allow_main_runtime_queued_calls"]=10512;var
__emsripten_main_thread_futex=Module["__emsripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromiseResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain();readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(

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console===\"undefined\")console={ };console.log=print;console.warn=console.error=typeof
printErr!==\"undefined\"?printErr:print } else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!=0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"^\")+1)}else{scriptDirectory=\"\"}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} }else{ }var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module[\"arguments\"]arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"]thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"]quit_=Module[\"quit\"];var
wasmBinary;if(Module[\"wasmBinary\"]wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!=\"object\"){abort(\"no native wasm
support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]} }var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!=\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)} }var UTF8Decoder=typeof
TextDecoder!=\"undefined\"?new TextDecoder(\"utf8\"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)} } }return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function

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stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAtAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=nul
l}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the

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wasm failed\"} }catch(err){ abort(err)} }function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
\"+wasmBinaryFile+\"\"}return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)}})else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}})} }return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)}})function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-
instantiate\")}addRunDependency(\"wasm-instantiate\");function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)} )}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))} }else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports} catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function
_emsripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emsripten_get_heap_size(){return HEAPU8.length}function
emsripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1} catch(e){}}function _emsripten_resize_heap(requestedSize){var oldSize=_emsripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emsripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iiovcnt,pnum){var num=0;for(var
i=0;i<iiovcnt;i++){var ptr=HEAP32[iiov+i*8>>2];var len=HEAP32[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function

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_thread_create(){return 6}function _pthread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).app
ly(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"z\"]).apply(null,arguments)};var

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_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][_"A"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][_"B"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][_"C"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["asm"][_"D"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][_"E"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][_"F"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["asm"][_"G"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["asm"][_"H"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["asm"][_"I"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["asm"][_"J"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["asm"][_"K"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["asm"][_"L"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["asm"][_"M"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["asm"][_"N"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["asm"][_"O"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["asm"][_"P"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["asm"][_"Q"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["asm"][_"R"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["asm"][_"S"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["asm"][_"T"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["asm"][_"U"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["asm"][_"V"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["asm"][_"W"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["asm"][_"X"]).apply(null,arguments)};var

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_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"Y"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"Z"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_" _"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"$"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"aa"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"ba"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"da"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"ga"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ha"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"ia"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][_"ja"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][_"ka"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][_"la"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][_"ma"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][_"na"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"ta"]).apply(null,arguments)};var

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_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][_"ua"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][_"za"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][_"Aa"]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][_"Ba"]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][_"Ca"]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][_"Da"]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][_"Ea"]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][_"Fa"]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][_"Ga"]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][_"Ia"]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][_"Ja"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][_"Ka"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][_"La"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][_"Ma"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][_"Na"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][_"Oa"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][_"Pa"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][_"Qa"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][_"Ra"]).apply(null,arguments)};var

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__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"][["Sa"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["Ta"]]).apply(nu
ll,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["Ua"]]).apply(null,argument
s)};var
___errno_location=Module["___errno_location"]=function(){return(___errno_location=Module["___errno_locati
on"]=Module["asm"][["Va"]]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["Wa"]]).
apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][["Xa"]]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ya"
]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"]("\n"),1});doRun(),1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}}run();\n\n return WasmBackendModule.ready\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\nimport './flags_wasm';\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
 './wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:

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number[], dtype: DataType):\n    DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n    this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n  numDataIds(): number {\n    return this.dataIdMap.numDataIds();\n  }\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start = util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n  move(\n    dataId: DataId, values: backend_util.BackendValues, shape: number[],\n    dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n      this.dataIdMap.set(\n        dataId,\n        {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n    }\n    return;\n  }\n  const size = util.sizeFromShape(shape);\n  const numBytes = size * util.bytesPerElement(dtype);\n  const memoryOffset = this.wasm._malloc(numBytes);\n  this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n  this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n  if (values != null) {\n    this.wasm.HEAPU8.set(\n      new Uint8Array(\n        (values as backend_util.TypedArray).buffer,\n        (values as backend_util.TypedArray).byteOffset, numBytes),\n      memoryOffset);\n  }\n  }\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset, dtype, shape, stringBytes} =\n      this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n      memoryOffset,\n      memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data = this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n    }\n    this.dataIdMap.delete(dataId);\n    return true;\n  }\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData = this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n  floatPrecision(): 32 {\n    return 32;\n  }\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n  memory() {\n    return {unreliable: false};\n  }\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n    TensorInfo {\n    let dataId: {};\n    if (memoryOffset == null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id = this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n  typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n    backend_util.TypedArray {\n    const buffer = this.wasm.HEAPU8.buffer;\n    const {memoryOffset} = this.dataIdMap.get(dataId);\n    const size = util.sizeFromShape(shape);\n    switch (dtype) {\n    case 'float32':\n      return new Float32Array(buffer, memoryOffset, size);\n    case 'int32':\n      return new Int32Array(buffer, memoryOffset, size);\n    case 'bool':\n      return new Uint8Array(buffer, memoryOffset, size);\n    default:\n      throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n  function createInstantiateWasmFunc(path: string) {\n    // this will be replace by rollup plugin patchWechatWebAssembly in\n    // miniprogram's output.\n    // tslint:disable-next-line:no-any\n    return (imports: any, callback: any) => {\n      util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n        if (!response['ok']) {\n          imports.env.a^ failed to load wasm binary file at '${path}';\n        }\n        response.arrayBuffer().then(binary => {\n          WebAssembly.instantiate(binary, imports).then(output => {\n            callback(output.instance, output.module);\n          });\n        });\n      });\n    };

```



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'int32':\n    return new Int32Array(buffer);\n  case 'bool':\n    return new Uint8Array(buffer);\n  default:\n    throw new Error(`Unknown dtype ${dtype}`);\n  }\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-wasm.wasm',\n  'tfjs-backend-wasm-simd.wasm',\n  'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n    'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n    ' will be removed in a future release.);\n  if (initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call ' +\n      '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n  }\n  wasmPath = path;\n  customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * @param js\n * setWasmPaths({\n *   'tfjs-backend-wasm.wasm': 'renamed.wasm',\n *   'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *   'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPaths(\n  prefixOrFileMap: string | {[key in WasmBinaryName]?: string},\n  usePlatformFetch = false): void {\n  if (initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call ' +\n      '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n      '`tf.ready()`);\n  }\n  if (typeof prefixOrFileMap === 'string') {\n    wasmPathPrefix = prefixOrFileMap;\n  } else {\n    wasmFileMap = prefixOrFileMap;\n    const missingPaths =\n      wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n    if (missingPaths.length > 0) {\n      throw new Error(\n        `There were no entries found for the following binaries: ` +\n        `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n        `map providing a path for each binary, or with a string indicating ` +\n        `the directory where all the binaries can be found.`);\n    }\n  }\n  customFetch = usePlatformFetch;\n}\n\n/**\n * Used in unit tests.\n */\nexport function resetWasmPath(): void {\n  wasmPath = null;\n  wasmPathPrefix = null;\n  wasmFileMap = {};\n  customFetch = false;\n  initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n * @param numThreads\n * This must be called before calling\n * `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n  threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n * @param\n * It is set after the backend is initialized.\n */\nexport function getThreadsCount(): number {\n  if (actualThreadsCount === -1) {\n    throw new Error(`WASM backend not initialized.`);\n  }\n  return actualThreadsCount;\n}\n\n",\n  "export const\n  wasmWorkerContents = `var Module={};function threadPrintErr(){var\n  text=Array.prototype.slice.call(arguments).join("\\ ");console.error(text)}function threadAlert(){var\n  text=Array.prototype.slice.call(arguments).join("\\\n  `);\n  `);postMessage({cmd:"alert",text:text,threadId:Module["_pthread_self"]()})}}var\n  err=threadPrintErr;this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){var\n  instance=new\n  WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);r\n  eturn instance.exports};function`

```

```

moduleLoaded() { this.onmessage=function(e){ try { if(e.data.cmd===\"load\") { Module[\"wasmModule\"]=e.data.wasmModule; Module[\"wasmMemory\"]=e.data.wasmMemory; Module[\"buffer\"]=Module[\"wasmMemory\"].buffer; Module[\"ENVIRONMENT_IS_PTHREAD\"]=true; if(typeof e.data.urlOrBlob===\"string\") { importScripts(e.data.urlOrBlob) } else { var objectUrl=URL.createObjectURL(e.data.urlOrBlob); importScripts(objectUrl); URL.revokeObjectURL(objectUrl) } WasmBackendModuleThreadedSimd(Module).then(function(instance) { Module=instance; moduleLoaded() }) else if(e.data.cmd===\"objectTransfer\") { Module[\"PThread\"].receiveObjectTransfer(e.data) } else if(e.data.cmd===\"run\") { Module[\"__performance_now_clock_drift\"]=performance.now()-e.data.time; Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0); var max=e.data.stackBase; var top=e.data.stackBase+e.data.stackSize; Module[\"establishStackSpace\"](top,max); Module[\"_emscripten_tls_init\"](); Module[\"PThread\"].receiveObjectTransfer(e.data); Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self\"])(),1); try { var result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg); if(!Module[\"getNoExitRuntime\"]()) Module[\"PThread\"].threadExit(result) } catch(ex) { if(ex===\"Canceled!\") { Module[\"PThread\"].threadCancel() } else if(ex!==\"unwind\") { if(ex instanceof Module[\"ExitStatus\"] { if(Module[\"getNoExitRuntime\"]()) { } else { Module[\"PThread\"].threadExit(ex.status) } } else { Module[\"PThread\"].threadExit(-2); throw ex } } } else if(e.data.cmd===\"cancel\") { if(Module[\"_pthread_self\"]()) { Module[\"PThread\"].threadCancel() } } else if(e.data.target===\"setimmediate\") { } else if(e.data.cmd===\"processThreadQueue\") { if(Module[\"_pthread_self\"]()) { Module[\"_emscripten_current_thread_process_queued_calls\"]() } } else { err[\"worker.js received unknown command \"+e.data.cmd]; err(e.data) } } catch(ex) { err[\"worker.js onmessage() captured an uncaught exception: \"+ex]; if(ex&&ex.stack) err(ex.stack); throw ex } }; if(typeof process===\"object\" && typeof process.versions===\"object\" && typeof process.versions.node===\"string\") { self={location:{href:__filename}}; } var onmessage=this.onmessage; var nodeWorkerThreads=require[\"worker_threads\"]; global.Worker=nodeWorkerThreads.Worker; var parentPort=nodeWorkerThreads.parentPort; parentPort.on[\"message\",function(data){ onmessage({data:data})}]; var nodeFS=require[\"fs\"]; var nodeRead=function(filename){ return nodeFS.readFileSync(filename, \"utf8\") }; function globalEval(x){ global.require=require; global.Module=Module; eval.call(null,x) } importScripts=function(f){ globalEval(nodeRead(f)); } postMessage=function(msg){ parentPort.postMessage(msg) }; if(typeof performance===\"undefined\") { performance={now:function(){ return Date.now() } } }; /** @license See the LICENSE file.
*/
This code is auto-generated, do not modify this file!
const version = '3.11.0';
export {version};
/**
 * @license
 * Copyright 2020 Google LLC. All Rights Reserved.
 * Licensed under the Apache License, Version 2.0 (the 'License');
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an 'AS IS' BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
*/
=====
import './flags_wasm';
import {registerBackend} from '@tensorflow/tfjs-core';
import {BackendWasm, init} from './backend_wasm';
export {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';
export {version as version_wasm} from './version';
const WASM_PRIORITY = 2;
registerBackend('wasm', async () => {
  const {wasm} = await init();
  return new BackendWasm(wasm);
},
WASM_PRIORITY);
],
names:[\"CppDType\", \"FusableActivation\", \"wasmFusedMatMul\", \"fusedMatMulConfig\", \"kernelName\", \"_FusedMatMul\", \"backendName\", \"setupFunc\", \"backend\", \"wasm\", \"cwrap\", \"kernelFunc\", \"args\", \"inputs\", \"attrs\", \"a\", \"b\", \"bias\", \"preluActivationWeights\", \"dtype\", \"Error\", \"transposeA\", \"transposeB\", \"activation\", \"leaky

```

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ENOTCONN","ETOOMANYREFS","EUSERS","EDQUOT","ESTALE","ENOTSUP","ENOMEDIUM","EILSEQ
","EOVERFLOW","ECANCELED","ENOTRECOVERABLE","EOWNERDEAD","ESTRPIPE","_emscripten_fut
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compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmMax: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n
'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n ]);\n\nfunction max(args: { backend:
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs }):\n TensorInfo {\n  const { backend, inputs, attrs } = args;\n
const { reductionIndices: axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes, originalAxes,
inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n  input = transposed;\n  inputId =
transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the
transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n
const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const maxConfig: KernelConfig = {\n  kernelName: Max,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: max as {} as KernelFunc\n};\n"}]

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Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n
'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n
'number', // padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
strideHeight\n  'number', // strideWidth\n  'number', // channels\n  'number', // outId\n  ]);\n}\n\nfunction
avgPool(\n  args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n  const {inputs, attrs,
backend} = args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
```



```

convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n
`wasm backend does not support dataFormat: ` +\n    `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n
}\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n    `was backend
only supports average pooling with dilation = [1, 1], ` +\n    `got [`${convInfo.dilationHeight},
`${convInfo.dilationWidth}]`.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n    outId);\n return out;\n}\n\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc\n};\n"}

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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/AvgPool.js.map

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nt":["/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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```
=====
*\n\nimport { backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { reshape } from './Reshape';\n\nimport { CppDType } from './types';\n\nlet wasmGather:
(\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize:
number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'array', //
xStrides\n  'number', // stridesSize\n  'number', // indicesId\n  'number', // batchSize\n  'array', //
outStrides\n  'number' // outId\n  ]);\n\nfunction gatherV2(\n  args: { backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { x,
indices } = inputs;\n  const { axis, batchDims } = attrs;\n\n  // Throw error when any index is out of bound.\n  const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n  const index
= indicesVals[i];\n  util.assert(\n    index <= axisDim - 1 && index >= 0,\n    () =>\n      `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]`);\n  }\n\n  const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n    x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n  const flattenX = reshape({\n    inputs: { x },\n    attrs: {\n      shape: [\n        shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n        shapeInfo.sliceSize\n      ]\n    },\n    backend\n  });\n  const
indicesSize = util.sizeFromShape(indices.shape);\n  const flattenIndex = reshape({\n    inputs: { x: indices },\n    attrs:
{ shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize] },\n    backend\n  });\n  const flattenOutputShape =
[\n    shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n    shapeInfo.sliceSize\n  ];\n\n  const out = backend.makeOutput(flattenOutputShape, x.dtype);\n  if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n  }\n  const stridesSize = flattenX.shape.length - 1;\n\n  const xData =
backend.dataIdMap.get(flattenX.dataId);\n  const xId = xData.id;\n\n  const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n  const indicesId = indicesData.id;\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const xStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n  const outStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n  wasmGather(\n    xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n    shapeInfo.batchSize, outStridesBytes, outId);\n\n  backend.disposeData(flattenX.dataId);\n  backend.disposeData(flattenIndex.dataId);\n\n  // reshape\n  out.shape =
shapeInfo.outputShape;\n  return out;\n  }\n\nexport const gatherV2Config: KernelConfig = {\n  kernelName:
GatherV2,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherV2.js.map

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* =====
*/
/**
* @deprecated Use `setWasmPaths` instead.
* Sets the path to the `.wasm` file which will be fetched when the wasm
* backend is initialized. See
* https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
* for more details.
* @param path wasm file path or url
* @param usePlatformFetch optional boolean to use platform fetch to download
* the wasm file, default to false.
*
* @doc {heading: 'Environment', namespace: 'wasm'}
*/

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.fesm.js

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No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n ]);\n\nfunction addn(args: {inputs:\n TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CCppType[out.dtype], outId);\n\n return out;\n }\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as { } as KernelFunc,\n};\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/AddN.js.map

No license file was found, but licenses were detected in source scan.

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```

```
=====\n*\n\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Maximum.js.map

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=====\n
*\n\nimport { KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number',
// x.shape.length\n    'number', // x.dtype\n    'number', // k\n    'bool', // sorted\n    'number', // outValuesId\n
    'number', // outIndicesId\n  ]);\n\n  export const topk:\n    (args: { inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs }) =>\n      TensorInfo[] | TensorInfo = ({ inputs, backend, attrs }) => {\n        const { x } = inputs;\n
        const { k, sorted } = attrs;\n        const xId = backend.dataIdMap.get(x.dataId).id;\n        const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n        const outputShape = x.shape.slice();\n
        outputShape[outputShape.length - 1] = k;\n        const outValues = backend.makeOutput(outputShape, x.dtype);\n
        const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n        const outIndices =
        backend.makeOutput(outputShape, 'int32');\n        const outIndicesId =
        backend.dataIdMap.get(outIndices.dataId).id;\n\n        wasmTopK(\n          xId, xShapeBytes, x.shape.length,
          CppDType[x.dtype], k, sorted,\n          outValuesId, outIndicesId);\n\n        return [outValues, outIndices];\n
      };\n\n  export const topKConfig: KernelConfig = {\n    kernelName: TopK,\n    backendName: 'wasm',\n    setupFunc:
```

setup,\n kernelFunc: topk as { } as KernelFunc,\n};\n"}}

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/TopK.js.map

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=====
\n
*/\n\nimport { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmOneHot: (\n  indicesId: number, depth:
number, onValue: number, offValue: number,\n  outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id\n
'number', // depth,\n    'number', // onValue\n    'number', // offValue\n    'number' // out_id\n  ]);\n\n  function
oneHot(\n    args: { inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm }) {\n    const { inputs,
backend, attrs } = args;\n    const { indices } = inputs;\n    const { depth, onValue, offValue } = attrs;\n\n    const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n
const indicesData = backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n
wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n    return out;\n  }\n\n  export const oneHotConfig:
KernelConfig = {\n    kernelName: OneHot,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: oneHot as
{ } as KernelFunc,\n  };\n}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/OneHot.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { cast } from './Cast';\n\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', // oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', // newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n\n  function resizeBilinear(args: {\n    backend: BackendWasm,\n    inputs: ResizeBilinearInputs,\n    attrs: ResizeBilinearAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n\n    const { images } = inputs;\n    const { alignCorners, halfPixelCenters, size } = attrs;\n    const [newHeight, newWidth] = size;\n    const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n    const outShape = [batch, newHeight, newWidth, numChannels];\n\n    let xData = backend.dataIdMap.get(images.dataId);\n    let castedData;\n    if (xData.dtype !== 'float32') {\n      castedData =\n        cast({ backend, inputs: { x: images }, attrs: { dtype: 'float32' }});\n      xData =\n        backend.dataIdMap.get(castedData.dataId);\n    }\n    const xId = xData.id;\n\n    const out =\n      backend.makeOutput(outShape, 'float32');\n    if (util.sizeFromShape(images.shape) === 0) {\n      return out;\n    }\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmResizeBilinear(\n      xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n      alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n    if (castedData !== null) {\n      backend.disposeData(castedData.dataId);\n    }\n\n    return out;\n  }\n\n  export const\n    resizeBilinearConfig: KernelConfig = {\n    kernelName: ResizeBilinear,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: resizeBilinear as {} as KernelFunc\n  };
}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ResizeBilinear.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"MaxPool.js","sourceRoot":"","sources":["../../src/kernels/MaxPool.ts"],"names":[],"mappings":"
```



```

{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n args: {inputs:

```



```

wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', //
batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', //
radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n
'number', // outId\n ]);\n\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n
backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} =
args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out =
backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues =
typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n
[...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY,
fillBytes, fillValues.length, outId);\n return out;\n}\n\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/RotateWithOffset.js.map

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No license file was found, but licenses were detected in source scan.

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```

CAAoC;QACpC,OAAO,CAAC,WAAW,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;KACxC;IAED,IAAI,QAAQ,EAAE;QACZ,UAAU;QACV,MAAM,QAAQ,GAAG,YAA,Y,CAAC,oBAAoB,CAAC,GAAG,CAAC,KA,K,EA AE,YAA,Y,CAAC,CAAC;QAC5E,GAAG,CAAC,KA,K,GAAG,QAAQ,CAAC;KACtB;IAED,IAAI,KA,K,CAA C,KA,K,KA,K,SAAS,EAAE;QAC7B,OAAO,CAAC,WAAW,CAAC,WAAW,CAAC,MAAM,CAAC,CAAC;K ACzC;IAED,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,UAAU,GAAiB;IACtC,UAAU, EAAE,IAAI;IACbB,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KA,K;IACbB,UAAU,EAAE,IAAwB;CACrC, CAAC", "sourcesContent": ["/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n    backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n  args: {\n    backend: BackendWasm,\n    inputs: MeanInputs,\n    attrs: MeanAttrs\n  }): TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n  const { transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length, input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims('mean',\n    reductionAxes, input.shape.length);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =\n    util.sizeFromShape(reduceShape);\n  let castedInput = input;\n  if (input.dtype !== 'float32') {\n    castedInput =\n      cast({\n        backend,\n        inputs: { x: input },\n        attrs: { dtype: 'float32' }\n      });\n    inputId =\n      backend.dataIdMap.get(castedInput.dataId).id;\n  }\n  const out = backend.makeOutput(outShape, 'float32');\n  if (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmMean(inputId, reduceSize, outId);\n  }\n  if (inputWasTransposed) {\n    // dispose of the transposed\n    tensor.\n      backend.disposeData(transposed.dataId);\n  }\n  if (keepDims) {\n    // reshape\n    const newShape =\n      backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n  if (input.dtype !== 'float32') {\n    backend.disposeData(castedInput.dataId);\n  }\n  return out;\n}\n\nexport const meanConfig: KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: mean as KernelFunc\n};\n\n} }
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Mean.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"tf-backend-wasm.es2017.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernel
```

```

s/Identity.ts", "../src/kernels/Transpose.ts", "../src/kernels/kernel_utils.ts", "../src/kernels/All.ts", "../src/kernels/Any.ts",
"../src/kernels/ArgMax.ts", "../src/kernels/AvgPool.ts", "../src/kernels/Reshape.ts", "../src/kernels/BatchMatMul.ts", "../
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Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n
int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { FusableActivation } from
'/types';\n\nlet wasmFusedMatMul:\n (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n

```



```

bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n    transposeB: boolean, activation: number,
biasId: number,\n    preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n    wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,
null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number', // activation\n    'number', // biasId\n    'number', // preluActivationWeightsId\n    'number', //
leakyreluAlpha\n    'number' // out_id\n    ]);\n\nfunction fusedBatchMatMul(args: {\n    inputs:
_FusedMatMulInputs,\n    backend: BackendWasm,\n    attrs: _FusedMatMulAttrs\n}) {\n    const {inputs, backend,
attrs} = args;\n    const {a, b, bias, preluActivationWeights} = inputs;\n\n    if (a.dtype !== 'float32' || b.dtype !==
'float32') {\n        throw new Error(\n            `_FusedMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n    const aId =
backend.dataIdMap.get(a.dataId).id;\n    const bId = backend.dataIdMap.get(b.dataId).id;\n\n    let biasId = 0;\n    if
(bias !== null) {\n        const biasData = backend.dataIdMap.get(bias.dataId);\n        if (biasData.shape.length !== 1) {\n
throw new Error(\n            `_FusedMatMul only supports rank-1 bias but got ` +\n                `rank
${biasData.shape.length}`);\n        }\n        biasId = biasData.id;\n    }\n    const preluActivationWeightsId =
preluActivationWeights == null ?\n        0 :\n        backend.dataIdMap.get(preluActivationWeights.dataId).id;\n    const
fusedActivation =\n        FusableActivation[activation as {} as keyof typeof FusableActivation];\n    if
(fusedActivation == null) {\n        throw new Error(\n            `${activation} activation not yet supported for
FusedConv2D ` +\n            `in the wasm backend.`);\n    }\n\n    const leftDim = transposeA ? a.shape[2] : a.shape[1];\n
const rightDim = transposeB ? b.shape[1] : b.shape[2];\n    const batchDim = a.shape[0];\n\n    const out =
backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes = new Uint8Array(new
Int32Array(a.shape).buffer);\n    const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n    wasmFusedMatMul(\n        aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n        transposeA,
transposeB, fusedActivation, biasId, preluActivationWeightsId,\n        leakyreluAlpha || 0, outId);\n\n    return
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n    kernelName: _FusedMatMul,\n    backendName:
'wasm',\n    setupFunc: setup,\n    kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
`License`);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an `AS IS` BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====)\n
*/\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nexport function
createUnaryKernelConfig(\n    kernelName: string, outType?: DataType): KernelConfig {\n    let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n    function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n        'number', // x_id\n        'number', // dtype\n
        'number', // out_id\n        ]);\n    }\n\n    function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}): \n
TensorInfo {\n        const {backend, inputs: {x}} = args;\n        const xId = backend.dataIdMap.get(x.dataId).id;\n        const
out = backend.makeOutput(x.shape, outType || x.dtype);\n        const outId = backend.dataIdMap.get(out.dataId).id;\n\n        // Short-circuit zero-sized tensors.\n        if (util.sizeFromShape(out.shape) === 0) {\n            return out;\n        }\n\n        wasmFunc(xId, CppDType[x.dtype], outId);\n        return out;\n    }\n\n    return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n}\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,

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```
=====\n*\nimport { Abs, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n"/**\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport { backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\nexport function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?: DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n     bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n      void;\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n      'number', // a_id,\n      'array', // a_shape\n      'number', // a_shape.length\n      'number', // b_id\n      'array', // b_shape\n      'number', // b_shape.length\n      'number', // dtype\n      'number' // out_id\n    ]);\n  }\n  function kernelFunc(args: { backend: BackendWasm, inputs: BinaryInputs }):\n    TensorInfo {\n    const { backend, inputs } = args;\n    const { a, b } = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId = backend.dataIdMap.get(b.dataId).id;\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape, outputType);\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return out;\n    }\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const kernelFunc = () => wasmFunc(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n      CppDType[a.dtype], outId);\n    // Currently only some float operations support full broadcast.\n    if (supportsFullBroadcast && a.dtype === 'float32') {\n      kernelFunc();\n      return out;\n    }\n    const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA && loopsOverAllOfB) {\n      kernelFunc();\n      return out;\n    } else {\n      throw new Error(\n        `Broadcasting along outer dims is not yet ` +\n        `supported for ${a.dtype} ${kernelName}.`);\n    }\n  }\n  return {\n    kernelName, backendName: 'wasm', setupFunc, kernelFunc;\n  };\n}\n"/**\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport { Add, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n"/**\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
```

file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { AddN, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport\n{ BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n ]);\n}\nfunction addn(args: { inputs:\n TensorInfo[], backend: BackendWasm }) {\n const { inputs, backend } = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as { } as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { Identity, IdentityInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport\n{ TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nexport function\nidentity(args: { inputs: IdentityInputs, backend: BackendWasm }):\n TensorInfo {\n const { inputs: { x }, backend } =\n args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.toArrayFromHeap(x);\n const outVals = backend.toArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as { } as\n KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { identity } from\n './Identity';\nimport { CppDType } from './types';\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array,\n xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>\n void;\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n ]);\n}\n\nexport function transpose(\n args:\n { inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs }):\n TensorInfo {\n const { inputs,\n backend, attrs } = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better
```

```

due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,
attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n  if (perm[i] !== i) {\n
permIsNoOp = false;\n  }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n
dataId: inputs.x.dataId,\n  shape: reducedShape,\n  dtype: inputs.x.dtype\n }; \n\n if (permIsNoOp) {\n  const
cloned = identity({inputs, backend});\n  cloned.shape = outShape;\n  return cloned;\n }\n\n const out =
backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId =
backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n
const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n  xId,
xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n  perm.length);\n return
out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new
Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n
return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]
{\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n
  if (shape[i] !== 1) {\n    newShape.push(shape[i]);\n  }\n  if (shape[perm[i]] !== 1) {\n
newPerm.push(perm[i]);\n  }\n }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j =
0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i &&\n        (minValIdx === -1 || newPerm[minValIdx] >
newPerm[j])) {\n        minValIdx = j;\n      }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape,
newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName:
'wasm',\n  kernelFunc: transpose as {} as KernelFunc,\n  setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright
2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose
if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n *
@param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,
axis: number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes:
number[],\n  inputWasTransposed: boolean\n } {\n  const xShape = x.shape;\n  const xRank =
x.shape.length;\n\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const
permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let
inputWasTransposed = false;\n  if (permutedAxes !== null) {\n    const newShape: number[] = new Array(xRank);\n
for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n\n    axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({inputs: {x}, attrs: {perm:
permutedAxes}, backend});\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId =
backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n
    }\n  }\n\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n"/**\n * @license\n *
Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from

```

```

'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null
/*void*/, [number, number, number]);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs:
AllAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,
null /*void*/, [number, number, number]);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,
attrs: AnyAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n
const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n
const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis,
backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n
input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====  
*  
\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-core';  
\n\nimport { BackendWasm } from '../backend_wasm';  
\n\nimport { permuteAxesAndTranspose } from './kernel_utils';  
\n\nimport { CppDType } from './types';  
\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize: number, innerSize: number, \n  outId: number) => void;  
\n\nfunction setup(backend: BackendWasm) {\n  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n\n  function argmax(\n    args: { inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs }) {\n    const { backend, inputs, attrs } = args;\n    const { axis } = attrs as {} as ArgMaxAttrs;\n    const { x } = inputs as {} as ArgMaxInputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const { transposed, axes, inputWasTransposed } =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n    }\n\n    const outShape = input.shape.slice(0, -1);\n    const out = backend.makeOutput(outShape, 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const outerSize = util.sizeFromShape(out.shape);\n    const innerSize = input.shape[axes[0]];\n    wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    return out;\n  }\n\n  export const argMaxConfig: KernelConfig = {\n    kernelName: ArgMax, \n    backendName: 'wasm', \n    kernelFunc: argmax as {} as KernelFunc, \n    setupFunc: setup\n  };  
}\n\n/*  
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 * Unless required by applicable law or agreed to in writing, software  
 * distributed under the License is distributed on an "AS IS" BASIS,  
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.  
 * See the License for the specific language governing permissions and  
 * limitations under the License.  
 */  
=====  
\n
```

```
=====  
*  
\n\nimport { AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';  
\n\nimport { BackendWasm } from '../backend_wasm';  
\n\nlet wasmAvgPool: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number, \n  filterHeight: number, filterWidth: number, padTop: number, padRight: number, \n  padBottom: number, padLeft: number, strideHeight: number, \n  strideWidth: number, channels: number, outId: number) => void;  
\n\nfunction setup(backend: BackendWasm) {\n  wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // channels\n    'number', // outId\n  ]);\n\n  function avgPool(\n    args: { inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs }) {\n    const { inputs, attrs, backend } = args;\n    const x = inputs.x as Tensor4D;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const { filterSize, strides, pad, dimRoundingMode } = attrs;\n    const convInfo = backend_util.computePool2DInfo(\n      x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const channels = convInfo.inChannels;\n\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n        `wasm backend does not support dataFormat: ` +\n        `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n    }\n\n    if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n      throw new Error(\n        `was backend`);\n    }\n  }\n\n  export const avgPoolConfig: KernelConfig = {\n    kernelName: AvgPool, \n    backendName: 'wasm', \n    kernelFunc: avgPool as {} as KernelFunc, \n    setupFunc: setup\n  };  
}\n
```

```

only supports average pooling with dilation = [1, 1], `+n` got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);
}
const out = backend.makeOutput(convInfo.outShape, 'float32');
const outId = backend.dataIdMap.get(out.dataId).id;
wasmAvgPool(\n` xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth, \n` padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels, \n
outId);
return out;
}
export const avgPoolConfig: KernelConfig = { \n` kernelName: AvgPool, \n
backendName: 'wasm', \n` setupFunc: setup, \n` kernelFunc: avgPool as { } as KernelFunc \n}; \n`, "/** \n * @license \n
* Copyright 2019 Google LLC. All Rights Reserved. \n * Licensed under the Apache License, Version 2.0 (the
'License'); \n * you may not use this file except in compliance with the License. \n * You may obtain a copy of the
License at \n * \n * http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable law or
agreed to in writing, software \n * distributed under the License is distributed on an 'AS IS' BASIS, \n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for
the specific language governing permissions and \n * limitations under the License. \n *
===== \n
*/ \n \n import { KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util } from '@tensorflow/tfjs-
core'; \n \n import { BackendWasm } from './backend_wasm'; \n \n export function reshape(\n` args: { inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm }) { \n` const { inputs, attrs } = args; \n` const { x } =
inputs; \n` const { shape } = attrs; \n \n` const xSize = util.sizeFromShape(x.shape); \n` const $shape =
util.inferFromImplicitShape(shape, xSize); \n \n` util.assert(\n` xSize === util.sizeFromShape($shape), \n` () =>
`new shape: ${$shape}, old shape: ${x.shape}. New shape and old `+n` `shape must have the same number of
elements.`); \n \n` // Backend needs to track refCount for the dataId for reshape op \n` args.backend.incRef(x.dataId); \n
return { dataId: x.dataId, shape: $shape, dtype: x.dtype }; \n \n` export const reshapeConfig: KernelConfig = { \n
kernelName: Reshape, \n` backendName: 'wasm', \n` kernelFunc: reshape as { } as KernelFunc \n}; \n`, "/** \n *
@license \n * Copyright 2019 Google LLC. All Rights Reserved. \n * Licensed under the Apache License, Version
2.0 (the 'License'); \n * you may not use this file except in compliance with the License. \n * You may obtain a
copy of the License at \n * \n * http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable
law or agreed to in writing, software \n * distributed under the License is distributed on an 'AS IS' BASIS, \n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for
the specific language governing permissions and \n * limitations under the License. \n *
===== \n
*/ \n \n import { BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util } from
'@tensorflow/tfjs-core'; \n \n import { BackendWasm } from './backend_wasm'; \n \n import { reshape } from
'./Reshape'; \n \n let wasmBatchMatMul: (\n` aId: number, aShape: Uint8Array, aShapeSize: number, bId: number, \n
bShape: Uint8Array, bShapeSize: number, transposeA: boolean, \n` transposeB: boolean, outId: number) =>
void; \n \n function setup(backend: BackendWasm) { \n` wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
null /* void */, [\n` 'number', // a_id \n` 'array', // a_shape \n` 'number', // a_shape.length \n` 'number', // b_id \n
'array', // b_shape \n` 'number', // b_shape.length \n` 'number', // transpose_a \n` 'number', // transpose_b \n
'number' // out_id \n]); \n \n function batchMatMul(args: { \n` inputs: BatchMatMulInputs, \n` backend:
BackendWasm, \n` attrs: BatchMatMulAttrs \n}) { \n` const { inputs, backend, attrs } = args; \n` const { a, b } = inputs; \n
const { transposeA, transposeB } = attrs; \n \n` if (a.dtype !== 'float32' || b.dtype !== 'float32') { \n` throw new Error(\n`
`BatchMatMul for non non-float32 tensors not yet supported.`); \n` } \n \n` const aRank = a.shape.length; \n` const
bRank = b.shape.length; \n \n` const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1]; \n` const
innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2]; \n \n` const outerShapeA = transposeA ?
a.shape[aRank - 1] : a.shape[aRank - 2]; \n` const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -
1]; \n \n` const outerDimsA = a.shape.slice(0, -2); \n` const outerDimsB = b.shape.slice(0, -2); \n \n` const batchDimA =
util.sizeFromShape(outerDimsA); \n` const batchDimB = util.sizeFromShape(outerDimsB); \n \n` const
batchDimsCompatible = \n` batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1; \n \n` util.assert(\n`
aRank >= 2 && bRank >= 2 && batchDimsCompatible, \n` () => `Error in matMul: the input
batch dimensions must either be the `+n` `same or at least one input batch dimension must be 1. Got input `

```



```

{\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as
[number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)
{\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number,
number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return
out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:
backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n
const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI;
i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:
[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK
+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)
{\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }\n }\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n
kernelFunc: slice as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{reshape} from './Reshape';\n\nimport {slice} from './Slice';\n\nimport {transpose} from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,
crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped =
backend_util.getReshaped(x.shape, blockShape, prod);\n\n const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n\n const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n\n const xTransposed =\n transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n\n const xTransposedReshaped = reshape(\n {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n\n const result = slice({\n inputs: {x: xTransposedReshaped},\n backend,\n
attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n
backend.disposeData(xTransposed.dataId);\n\n backend.disposeData(xReshaped.dataId);\n\n return

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result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n  TensorInfo {\n  const {inputs: {x}, attrs: {dtype}, backend} = args;\n  const out = backend.makeOutput(x.shape, dtype);\n  const inVals = backend.toArrayFromHeap(x);\n  const outVals = backend.toArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =\n    backend.wasm.cwrap(ClipByValue, null /* void */, [\n      'number', // x_id\n      'number', // min\n      'number', //\n      max\n      'number' // out_id\n    ]);\n\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend: BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =\n      backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId,\n      clipValueMin, clipValueMax, outId);\n    return out;\n  }\n\n  export const clipByValueConfig: KernelConfig = {\n    kernelName: ClipByValue,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: clip as {} as\n      KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the
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License.\n *

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=====\n
*\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concatImplCPU} from
'./kernel_utils/shared';\n\nimport {identity} from './Identity';\n\nimport {reshape} from './Reshape';\n\n\nexport function
concat(\n  args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n  const {inputs, backend}
= args;\n\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n  let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n  // Keep only non-empty tensors (ignore tensors
with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n\n  if ($inputs.length ===
1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n\n  const out = backend.makeOutput(outShape,
inputs[0].dtype);\n\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n\n  const shapes =
$inputs.map(t => t.shape);\n\n  backend_util.assertParamsConsistent(shapes, axis);\n\n  if ($inputs[0].dtype ===
'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-
dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors into those less than
the\n    // axis to be concatenated and the rest. Then reshape the tensors\n    // into a two-dimensional tensor by
collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n
// the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize =
util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({inputs: {x: t},
backend, attrs: {shape}});\n    });\n\n    const inputsValShapes = inputs2D.map(t => {\n      return {vals:
backend.readSync(t.dataId), shape: t.shape};\n    });\n\n    // Concat 2d tensors along axis=1.\n    outShape =\nbackend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n    const simplyConcat =
inputs2D[0].shape[0] === 1;\n    const outVals = concatImplCPU(\n      inputsValShapes, outShape,\n      inputs[0].dtype,\n      simplyConcat) as string[];\n\n    const finalOutShape =\nbackend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n    out.shape = finalOutShape;\n    const
outData = backend.dataIdMap.get(out.dataId);\n    outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);\n\n    inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n
return out;\n  }\n\n  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n\n  let sumInnerDims =
0;\n\n  const innerDims = $inputs.map(input => {\n    const innerDim = util.sizeFromShape(input.shape.slice(axis));\n
sumInnerDims += innerDim;\n    return innerDim;\n  });\n\n  const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));\n\n  const outVals = backend.typedArrayFromHeap(out);\n\n  for (let b = 0; b <
batchDim; b++) {\n    let outOffset = b * sumInnerDims;\n    for (let i = 0; i < inVals.length; i++) {\n      const
innerDim = innerDims[i];\n      const inOffset = b * innerDim;\n      const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n      outVals.set(vals, outOffset);\n      outOffset += innerDim;\n    }\n  }\n\n  return
out;\n}\n\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as {} as KernelFunc,\n};\n\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\n\nlet wasmConv2d: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number,
filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad:
number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number,
inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\n\nfunction setup(backend:
```



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*\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast}
from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest
= 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes:
number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number,
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n
    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n
    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n
    'number' // out id\n  ]);\n}\n\nfunction cropAndResize(args: {\n  backend: BackendWasm,\n  inputs: CropAndResizeInputs,\n
  attrs: CropAndResizeAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {method,
  extrapolationValue, cropSize} = attrs;\n  const {image, boxes, boxInd} = inputs;\n  const numBoxes =
  boxes.shape[0];\n  const [cropHeight, cropWidth] = cropSize as [number, number];\n  const outShape =
  [numBoxes, cropHeight, cropWidth, image.shape[3]];\n  let imagesData =
  backend.dataIdMap.get(image.dataId);\n  let castedData;\n  if (image.dtype !== 'float32') {\n    castedData =
  cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n    imagesData =
  backend.dataIdMap.get(castedData.dataId);\n  }\n  const imagesId = imagesData.id;\n  const boxesId =
  backend.dataIdMap.get(boxes.dataId).id;\n  const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n  const
  out = backend.makeOutput(outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
  imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n  const wasmCropAndResize(\n
  imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n  cropWidth,\n  InterpolationMethod[method as {}] as keyof typeof InterpolationMethod,\n  extrapolationValue, outId);\n  if
  (castedData !== null) {\n    backend.disposeData(castedData.dataId);\n  }\n  return out;\n}\n\nexport const
  cropAndResizeConfig: KernelConfig = {\n  kernelName: CropAndResize,\n  backendName: 'wasm',\n  setupFunc:
  setup,\n  kernelFunc: cropAndResize as {} as KernelFunc\n};\n\n/**\n * @license\n * Copyright 2020 Google
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  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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  =====\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from
  './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
  number,\n  finalDim: number, outId: number, dtype: CCppType) => void;\n\nfunction setup(backend:
  BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n    'number', // x_id\n
    'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n
    'number' // dtype\n  ]);\n}\n\nexport function cumsum(\n  args: {inputs: CumsumInputs, backend: BackendWasm,
  attrs: CumsumAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis,
  exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n  util.assert(x.dtype === 'float32' || x.dtype ===
  'int32',\n  () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n  // permute required axis
  to inner most axis\n  const permutation = backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n
  if (permutation !== null) {\n    permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n
  const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum',
  [permutedAxis], xRank);\n  const permutedOut =
  backend.makeOutput(permutedX.shape, permutedX.dtype);\n  const finalDim = permutedX.shape[permutedAxis];\n
  const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId =

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backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n      permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n   const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n   out = transpose(\n     {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n   backend.disposeData(permutedX.dataId);\n
backend.disposeData(permutedOut.dataId);\n } \n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *
=====\n
*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n    'number', // xId\n    'number', // blockSize\n    'number', // channelsLast\n    'array', // xStrides\n
'number', // xStridesLength\n    'array', // outputShape\n    'array', // outputStrides\n    'number', // outSize\n
'number', // outId\n  ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs:
DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight
= (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ?
x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const
outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth =
inputDepth / (blockSize * blockSize);\n\n  const outputShape = (dataFormat === 'NHWC') ?\n    [batchSize,
outputHeight, outputWidth, outputDepth] :\n    [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const
out = backend.makeOutput(outputShape, 'float32');\n\n  const xData = backend.dataIdMap.get(x.dataId);\n  const
xId = xData.id;\n  const xStridesBytes =\n    new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n  const outStridesBytes =\n    new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  wasmDepthToSpace(\n    xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n    outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n  return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n", "/*\n * @license\n *
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport

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{BackendWasm} from './backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,
inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop:
number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight:
number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number,
outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmDepthwiseConv2d =\n  backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n    'number', //
xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', //
filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\nfunction
depthwiseConv2d(args: {\n  inputs: DepthwiseConv2dNativeInputs,\n  backend: BackendWasm,\n  attrs:
DepthwiseConv2dNativeAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n  const
xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n  const $dilations = dilations === null ? [1, 1] : dilations;\n\n
const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape,
strides,\n    ($dilations as number | [number, number]), pad, dimRoundingMode,\n    true /* depthwise */);\n\n
const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop =
convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n  if
(convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend DepthwiseConv2dNative
does not support dataFormat:` +\n      ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n    filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n    outputChannels, outId);\n  return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n  kernelName: DepthwiseConv2dNative,\n  backendName: 'wasm',\n  setupFunc: setup,\n
kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *
=====
*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n *
=====
*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from

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./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

=====\n\n*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

=====\n\n*\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let \$dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [\${-(inputRank + 1)}, \${inputRank}]`);\n \$dim = inputRank + dim + 1;\n }\n newShape.splice(\$dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

=====\n\n*\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs: FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out = backend.makeOutput(shape, dtype);\n const outVals = backendtypedArrayFromHeap(out);\n outVals.fill(value as number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName: 'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n  args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n  const {image} = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  wasmFlipLeftRight(\n    imageId, batch, imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig:\n  KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'wasm',\n  kernelFunc: flipLeftRight as {\n  KernelFunc,\n  setupFunc: setup\n};\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const floorDivConfig: KernelConfig =\n  createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number', 'number', 'number', 'number', 'number'];\n  );\n}\n\nfunction fusedBatchNorm(args: {\n  backend: BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId =

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backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:
FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport { backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ FusableActivation } from './types';\n\nlet wasmFusedConv2d:\n (xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number,
padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number,
dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n
inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n
wasmfusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n
'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n
'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //
inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n ]);\n}\n\nfunction
fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n})
{\n const { inputs, attrs, backend } = args;\n const { x, filter, bias, preluActivationWeights } = inputs;\n const {\n
strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } =
attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n
FusableActivation[activation as { } as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n
throw
new Error(\n ` ${activation} activation not yet supported for FusedConv2D ` +\n `in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw
new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank
${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw
new Error(\n `FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels
(${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const
filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight =
convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const
strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =

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convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n   `wasm backend FusedConv2D does not support
dataFormat:` +\n   `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n  0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n  xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n  biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n  dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n  fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
fusedConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====*\n
*\n\nimport { backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\nfunction
fusedDepthwiseConv2d(args: {\n  inputs: FusedDepthwiseConv2DInputs,\n  backend: BackendWasm,\n  attrs:
FusedDepthwiseConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias,
preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode, true /* depthwise */);\n\n  const fusedActivation =\n    FusableActivation[activation as {}
as keyof typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n      `${activation}
activation not yet supported for FusedDepthwiseConv2D` +\n      `in the wasm backend.`);\n  }\n\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const
outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got` +\n      `rank ${biasData.shape.length}.`);\n    }\n    if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n      `FusedDepthwiseConv2D bias shape

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({biasData.shape}) does not match the number of output channels (${outputChannels});\n }\n
biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n \wasn backend FusedDepthwiseConv2D does not support
dataFormat:" +\n \`${dataFormat}`. Please use 'NHWC'.');\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet
wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n
'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', //
sliceSize\n 'array', // strides\n 'number' // outId\n ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} =
inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params,
indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return
out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n
const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes,
outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {reshape} from './Reshape';\n\nimport {CppType} from './types';\n\nlet wasmGather:
(\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize:
number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'array',
// xStrides\n  'number', // stridesSize\n  'number', // indicesId\n  'number', // batchSize\n  'array', //
outStrides\n  'number' // outId\n  ]);\n}\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x,
indices} = inputs;\n  const {axis, batchDims} = attrs;\n\n  // Throw error when any index is out of bound.\n  const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n  const index
= indicesVals[i];\n  util.assert(\n    index <= axisDim - 1 && index >= 0,\n    () =>\n      `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]);\n  }\n\n  const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n    x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n  const flattenX = reshape({\n    inputs: {x},\n    attrs: {\n      shape: [\n        shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n        shapeInfo.sliceSize\n      ]\n    },\n    backend\n  });\n  const
indicesSize = util.sizeFromShape(indices.shape);\n  const flattenIndex = reshape({\n    inputs: {x: indices},\n    attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n    backend\n  });\n  const flattenOutputShape =
[\n    shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n    shapeInfo.sliceSize\n  ];\n\n
const out = backend.makeOutput(flattenOutputShape, x.dtype);\n  if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n  }\n  const stridesSize = flattenX.shape.length - 1;\n\n  const xData =
backend.dataIdMap.get(flattenX.dataId);\n  const xId = xData.id;\n\n  const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n  const indicesId = indicesData.id;\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const xStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n  const outStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n  wasmGather(\n    xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n    shapeInfo.batchSize, outStridesBytes, outId);\n\n  backend.disposeData(flattenX.dataId);\n  backend.disposeData(flattenIndex.dataId);\n\n  // reshape\n  out.shape =
shapeInfo.outputShape;\n  return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n  kernelName:
GatherV2,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n", "/**\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterConfig: KernelConfig =\n  createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n\n", "/**\n
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n  createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019
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may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from
 './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu,
  null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // leakyrelu_alpha\n    'number', //
  out_id\n  ]);\n}\n\nexport function leakyRelu(\n  args: \n    {inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
  backend: BackendWasm}): \n  TensorInfo {\n  const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n  const xId =
  backend.dataIdMap.get(x.dataId).id;\n  // According to TF API, LeakyRelu returns float32 when input is either
  float32\n  // or int32.\n  const out = backend.makeOutput(x.shape, 'float32');\n\n  if (util.sizeFromShape(x.shape)
  !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmFunc(xId, CppDType[x.dtype], alpha,
  outId);\n  }\n\n  return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n  kernelName: LeakyRelu,\n
  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: leakyRelu as {} as KernelFunc,\n};\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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=====\n
*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n  createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n  http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n  createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019
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may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
 './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n", "/*\n * @license\n *
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 \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019
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 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
 {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMax: (xId:
 number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
 BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n
    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function max(args: {backend:
 BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
    const {reductionIndices, keepDims} = attrs;\n    const {x} = inputs;\n    const xId =
    backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes,
 inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n
      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      input = transposed;\n      inputId =
      transposedId;\n    }\n\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('max',
 axes, inputRank);\n    const [outShape, reduceShape] =\n
      backend_util.computeOutAndReduceShapes(input.shape, axes);\n    const reduceSize =
      util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n    if
      (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n
      wasmMax(inputId, CCppType[x.dtype], reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the
 transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n
      const\n      newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n
    return out;\n  }\n\n  export const maxConfig: KernelConfig = {\n    kernelName: Max,\n    backendName: 'wasm',\n
    setupFunc: setup,\n    kernelFunc: max as {} as KernelFunc\n  };\n", "/*\n * @license\n * Copyright 2019 Google
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 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', //
inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', //
padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', //
inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} =
args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  // TF API
supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it
because it uses xnnpack which only\n  // supports float32.\n  //\n  // Add the following assert only for the WASM
backend instead of at core op\n  // level.\n  //\n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype
=== 'float32',\n    () =>\n      `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm
backend does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n  return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n  kernelName: MaxPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: maxPool
as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n  backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n  args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs};\n  TensorInfo {\n    const {backend, inputs,
attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if
(inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId
!== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input =
transposed;\n        inputId = transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n      }\n    }\n\n    backend_util.assertAxesAreInnerMostDims(\n      'mean',
reductionAxes, input.shape.length);\n    const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize =
util.sizeFromShape(reduceShape);\n    let castedInput = input;\n    if (input.dtype !== 'float32') {\n      castedInput =\n      cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n      inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(outShape, 'float32');\n    if
(util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmMean(inputId,
reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the transposed
tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    if (input.dtype
!== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n\n    return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: mean as {}
as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n}\n\nfunction min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs};\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const
{axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let
inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We
will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n    }\n\n    const inputRank = input.shape.length;\n\n    backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape,
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axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape,
input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if
(inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n
}\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n
kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\ncreateBinaryKernelConfig(Minimum, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-
paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n ]);\n}\n\nfunction
mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const
{inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /*
beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =
backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat =
paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const
postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes,
MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc:
setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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```


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```
=====\n*\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n  createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { BackendWasm } from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n/*\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`\n */\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset: number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n    NonMaxSuppressionV3,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', // scoreThreshold\n    ]);\n\n  function kernelFunc(args: {\n    backend: BackendWasm,\n    inputs: NonMaxSuppressionV3Inputs,\n    attrs: NonMaxSuppressionV3Attrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {iouThreshold,
```

```

maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset =\n  wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n  parseResultStruct(backend, resOffset);\n\n
// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor
=\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as { } as
KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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===== \n
*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV4,\n    'number', // Result*\n    [\n      'number', // boxesId\n
      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', //
scoreThreshold\n      'bool', // padToMaxOutputSize\n    ]);\n\nfunction nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize} =\n    attrs;\n  const {boxes, scores} = inputs;\n\n  const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const
resOffset = wasmFunc(\n    boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n  const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n  // Since we are not using scores for V4, we have to delete it from the
heap.\n  backend.wasm._free(pSelectedScores);\n\n  const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n  return [selectedIndicesTensor,
validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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```

```

===== \n
*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n

```

```
(boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n  softNmsSigma: number) =>\n  number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =\n  backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', //\n      scoreThreshold\n      'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n    backend:\n    BackendWasm,\n    inputs: NonMaxSuppressionV5Inputs,\n    attrs: NonMaxSuppressionV5Attrs\n  }): TensorInfo[]\n  {\n    const {backend, inputs, attrs} = args;\n    const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma}\n    = attrs;\n    const {boxes, scores} = inputs;\n\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const\n    scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId,\n      maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n\n    const {pSelectedIndices, selectedSize,\n    pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n\n    // Since we are not using\n    validOutputs for V5, we have to delete it from the\n    // heap.\n    backend.wasm._free(pValidOutputs);\n\n    const\n    selectedIndicesTensor =\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n    const\n    selectedScoresTensor =\n    backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n    return\n    [selectedIndicesTensor, selectedScoresTensor];\n  }\n\n  export const nonMaxSuppressionV5Config: KernelConfig =\n  {\n    kernelName: NonMaxSuppressionV5,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: kernelFunc\n  } as KernelFunc,\n  };\n\n  /**\n   * @license\n   * Copyright 2020 Google LLC. All Rights Reserved.\n   * Licensed\n   * under the Apache License, Version 2.0 (the "License");\n   * you may not use this file except in compliance with the\n   * License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing, software\n   * distributed under the License is distributed\n   * on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n   * implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the\n   * License.\n   */
```

```
=====\n\n  *import {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n  *import {createBinaryKernelConfig} from\n  './binary_kernel';\n  *const supportsFullBroadcast = false;\n  *export const notEqualConfig: KernelConfig =\n  *createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n\n  /**\n   * @license\n   * Copyright 2020\n   * Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you\n   * may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,\n   * software\n   * distributed under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES\n   * OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language\n   * governing permissions and\n   * limitations under the License.\n   */
```

```
=====\n\n  *import {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-\n  *core';\n  *import {BackendWasm} from './backend_wasm';\n  *let wasmOneHot: (\n  *  indicesId: number, depth:\n  *  number, onValue: number, offValue: number,\n  *  outId: number) => void;\n\n  *function setup(backend:\n  *BackendWasm) {\n  *  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n  *    'number', // indices_id\n  *    'number', // depth,\n  *    'number', // onValue\n  *    'number', // offValue\n  *    'number' // out_id\n  *  ]);\n\n  *function\n  *oneHot(\n  *  args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n  *    const {inputs,\n  *    backend, attrs} = args;\n  *    const {indices} = inputs;\n  *    const {depth, onValue, offValue} = attrs;\n  *    const out =\n  *    backend.makeOutput([...indices.shape, depth], 'int32');\n  *    const outId = backend.dataIdMap.get(out.dataId).id;\n  *    const\n  *    indicesData = backend.dataIdMap.get(indices.dataId);\n  *    const indicesId = indicesData.id;\n  *    wasmOneHot(indicesId, depth, onValue, offValue, outId);\n  *    return out;\n  *  }\n\n  *export const oneHotConfig:\n  *KernelConfig = {\n  *  kernelName: OneHot,\n  *  backendName: 'wasm',\n  *  setupFunc: setup,\n  *  kernelFunc: oneHot\n  *} as\n  *KernelFunc,\n  *};\n\n  /**\n   * @license\n   * Copyright 2020 Google LLC. All Rights Reserved.\n   * Licensed\n   * under the Apache License, Version 2.0 (the "License");\n   * you may not use this file except in compliance with the\n   * License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless\n   * required by applicable law or agreed to in writing, software\n   * distributed\n   * under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES\n   * OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language\n   * governing permissions and\n   * limitations under the\n   * License.\n   */
```

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```
=====  
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====  
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\n\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n  args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n  TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {axis} = attrs;\n\n  if (inputs.length === 1) {\n    return expandDims(\n      {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n  }\n\n  const shape = inputs[0].shape;\n  const dtype = inputs[0].dtype;\n\n  inputs.forEach(t => {\n    util.assertShapesMatch(\n      shape, t.shape,\n      'All tensors passed to stack must have matching shapes');\n    util.assert(\n      dtype === t.dtype,\n      () => 'All tensors passed to stack must have matching dtypes');\n  });\n\n  const intermediateTensorInfos: TensorInfo[] = [];\n  const expandedTensors = inputs.map(t => {\n    const expandedT =\n      expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n    intermediateTensorInfos.push(expandedT);\n    return expandedT;\n  });\n\n  const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n  intermediateTensorInfos.forEach(t =>\n    backend.disposeData(t.dataId));\n\n  return result;\n}\n\nexport const packConfig: KernelConfig = {\n  kernelName: Pack,\n  backendName: 'wasm',\n  kernelFunc: pack as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====  
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType} from './types';\n\nlet wasmpadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmpadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n  ]);\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n  const outShape = paddings.map((p, i) =>
```



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*/\n\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n
'number',\n    'number'\n  ]);\n}\n\nfunction prod(args: {\n  backend: BackendWasm,\n  inputs: ProdInputs,\n  attrs:
ProdAttrs\n}): TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{ transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  let
reductionAxes = axes;\n  if (inputWasTransposed) {\n    const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We
will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n
reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length, input.shape.length);\n    }\n  }\n\n
backend_util.assertAxesAreInnerMostDims(\n    'prod', reductionAxes, input.shape.length);\n  const [outShape,
reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize
= util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const prodConfig: KernelConfig = {\n  kernelName: Prod,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: prod as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*/\n\nimport { KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from './backend_wasm';\n\nimport { rangeImplCPU } from './kernel_utils/shared';\n\nexport const
range =\n  (args: {\n    backend: BackendWasm,\n    attrs: RangeAttrs\n}): TensorInfo => {\n    const { backend, attrs } =
args;\n    const { start, stop, step, dtype } = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n\n
const out = backend.makeOutput([values.length], dtype);\n    const outVals =
backend.typedArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\nexport const rangeConfig:
KernelConfig = {\n  kernelName: Range,\n  backendName: 'wasm',\n  kernelFunc: range as { } as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n *

```

```

=====
*/\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n  createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC.

```

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```
=====\n*\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', // oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', // newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n}\nfunction resizeBilinear(args: {\n  backend: BackendWasm,\n  inputs: ResizeBilinearInputs,\n  attrs: ResizeBilinearAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {images} = inputs;\n  const {alignCorners, halfPixelCenters, size} = attrs;\n  const [newHeight, newWidth] = size;\n  const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n  const outShape = [batch, newHeight, newWidth, numChannels];\n  let xData = backend.dataIdMap.get(images.dataId);\n  let castedData;\n  if (xData.dtype !== 'float32') {\n    castedData = cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n    xData = backend.dataIdMap.get(castedData.dataId);\n  }\n  const xId = xData.id;\n  const out = backend.makeOutput(outShape, 'float32');\n  if (util.sizeFromShape(images.shape) === 0) {\n    return out;\n  }\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmResizeBilinear(\n    xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n    alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n  if (castedData !== null) {\n    backend.disposeData(castedData.dataId);\n  }\n  return out;\n}\nexport const resizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: resizeBilinear as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
```

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```
=====  
*  
import {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from  
'@tensorflow/tfjs-core';  
import {BackendWasm} from './backend_wasm';  
import {identity} from './Identity';  
import {reshape} from './Reshape';  
let wasmReverse: (\n  xId: number, axes: Uint8Array,  
  axesLength: number, outShape: Uint8Array,  
  outShapeLength: number, outId: number) => void;  
function  
setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id  
'array', // axes  
'number', // axes_length  
'array', // out_shape  
'number', // out_shape_length  
'number', // out_id  
]);  
}  
export function reverse(\n  args: {inputs: ReverseInputs, backend: BackendWasm, attrs:  
  ReverseAttrs}):  
  TensorInfo {\n  const {inputs, backend, attrs} = args;  
  const {x} = inputs;  
  const {dims} = attrs;  
  const axes = util.parseAxisParam(dims, x.shape);  
  if (x.shape.length === 0) {\n    return  
    identity({inputs: {x}, backend});  
  }  
  const out = backend.makeOutput(x.shape, x.dtype);  
  const xId =  
    backend.dataIdMap.get(x.dataId).id;  
  const outId = backend.dataIdMap.get(out.dataId).id;  
  const axesBytes =  
    new Uint8Array(new Int32Array(axes).buffer);  
  const outShapeBytes = new Uint8Array(new  
    Int32Array(x.shape).buffer);  
  wasmReverse(\n    xId, axesBytes, axes.length, outShapeBytes, x.shape.length,  
    outId);  
  const reshaped =\n    reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});  
  backend.disposeData(out.dataId);  
  return reshaped;  
}  
export const reverseConfig: KernelConfig = {\n  kernelName: Reverse,  
  backendName: 'wasm',  
  kernelFunc: reverse as {} as KernelFunc,  
  setupFunc:  
  setup\n};  
/**  
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 * License.  
 */  
=====  
*  
import {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,  
  TensorInfo} from '@tensorflow/tfjs-core';  
import {backend_util} from '@tensorflow/tfjs-core';  
import  
{BackendWasm} from './backend_wasm';  
let wasmRotate: (\n  xId: number, batch: number, imageHeight:  
  number, imageWidth: number,  
  numChannels: number, radians: number, centerX: number, centerY: number,  
  fillBytes: Uint8Array, fillLength: number, outId: number) => void;  
function setup(backend: BackendWasm) {\n  wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n    'number', // xId  
'number', //  
  batch  
'number', // imageHeight  
'number', // imageWidth  
'number', // numChannels  
'number', //  
  radians  
'number', // centerX  
'number', // centerY  
'array', // fillBytes  
'number', // fillLength  
'number', // outId  
]);  
}  
export function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,  
  backend: BackendWasm,  
  attrs: RotateWithOffsetAttrs}):  
  TensorInfo {\n  const {inputs, backend, attrs} =  
  args;  
  const {image} = inputs;  
  const {radians, fillValue, center} = attrs;  
  const out =  
  backend.makeOutput(image.shape, image.dtype);  
  const imageId = backend.dataIdMap.get(image.dataId).id;  
  const outId = backend.dataIdMap.get(out.dataId).id;  
  const [batch, imageHeight, imageWidth, numChannels] =  
  image.shape;  
  const [centerX, centerY] =\n    backend_util.getImageCenter(center, imageHeight,  
  imageWidth);  
  const fillIsBlack = fillValue === 0;  
  const fullOpacityValue = 255;  
  const fillValues =  
  typeof fillValue === 'number' ?\n    [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :  
  [...fillValue, fullOpacityValue];  
  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);  
  wasmRotate(\n    imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,  
    centerY,  
    fillBytes, fillValues.length, outId);  
  return out;  
}  
export const rotateWithOffsetConfig: KernelConfig = {\n
```


kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', // sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs: ScatterNdInputs, attrs: ScatterNdAttrs\n    }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices, updates} = inputs;\n    const {shape} = attrs;\n    const out = backend.makeOutput(shape, updates.dtype);\n    if (util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n    const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n    const indicesData = backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n    const updatesData = backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n    const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n      sliceSize, stridesBytes, outputSize, outId);\n    return out;\n  }\n  export const scatterNdConfig: KernelConfig = {\n    kernelName: ScatterNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: scatterNd as {} as KernelFunc\n  };\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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```
=====
*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (conditionId: number, tId: number, eId: number, offset: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect = backend.wasm.cwrap('SelectV2', null, [number, // conditionId\n  number, // tId\n  number, // eId\n  number, // offset\n  number, // outId\n  ]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n  const {inputs, backend} = args;\n  const {condition, t, e} = inputs;\n  const conditionId = backend.dataIdMap.get(condition.dataId).id;\n  const tId = backend.dataIdMap.get(t.dataId).id;\n  const eId = backend.dataIdMap.get(e.dataId).id;\n  const out = backend.makeOutput(t.shape, t.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const cRank = condition.shape.length;\n  const tRank = t.shape.length;\n  const offset = cRank === 0 || cRank > 1 || tRank === 1 ? 1 : util.sizeFromShape(t.shape.slice(1));\n  wasmSelect(conditionId, tId, eId, offset, outId);\n  return out;\n}\n\nexport const selectConfig: KernelConfig = {\n  kernelName: Select,\n  backendName: 'wasm',\n  kernelFunc: select as {} as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====
*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap('Sigmoid', null, [void *, [number, 'number']]);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}): TensorInfo {\n  const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n  wasmFunc(xId, outId);\n  return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n  kernelName: 'Sigmoid',\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sigmoid as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====
*\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from '../unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
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the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId:\n number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n    'number', // xId\n    'number', // outId\n    'number', // channels\n    'number' // batch\n  ]);\n\n  function softmax(\n    args: { backend: BackendWasm,\n    inputs: SoftmaxInputs, attrs: SoftmaxAttrs }):\n    TensorInfo {\n    const { backend, inputs: { logits }, attrs: { dim } } =\n    args;\n    const xId = backend.dataIdMap.get(logits.dataId).id;\n    const out = backend.makeOutput(logits.shape,\n    logits.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const channels = logits.shape[dim];\n    const batch = util.sizeFromShape(logits.shape) / channels;\n\n    // Short-circuit zero-sized tensors.\n    if\n    (util.sizeFromShape(out.shape) === 0) {\n      return out;\n    }\n\n    wasmFunc(xId, outId, channels, batch);\n    return\n    out;\n  }\n\n  export const softmaxConfig: KernelConfig = {\n    kernelName: Softmax,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: softmax as { } as KernelFunc\n  }; \n  /**\n   * @license\n   * Copyright 2021 Google\n   * LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the\n   * \"License\");\n   * you may not\n   * use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * \n   *  
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```

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,\n SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { padV2Config } from\n './PadV2';\n\nimport { reshape } from './Reshape';\n\nimport { transpose } from './Transpose';\n\nfunction\n spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:\n  SpaceToBatchNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockSize,\n  paddings } = attrs;\n\n  const prod = util.sizeFromShape(blockShape);\n\n  const completePaddings: Array<[number,\n  number]> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<[number,\n  number]>));\n\n  for (let i = 1 +\n  blockSize.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n\n  const paddedX =\n  padV2Config.kernelFunc({\n    inputs: { x },\n    backend,\n    attrs: { paddings: completePaddings, constantValue:\n    0 }\n  }) as TensorInfo;\n\n  const reshapedPaddedShape =\n  backend_util.getReshaped(paddedX.shape,\n  blockSize, prod, false);\n\n  const permutedReshapedPaddedPermutation =\n  backend_util.getPermuted(\n  reshapedPaddedShape.length, blockSize.length, false);\n\n  const flattenShape =\n  backend_util.getReshapedPermuted(paddedX.shape, blockSize,\n  prod, false);\n\n  const reshapeInputs:\n  ReshapeInputs = { x: paddedX };\n  const reshapeAttrs: ReshapeAttrs = { shape: reshapedPaddedShape };\n  const\n  paddedXReshaped =\n  reshape({ inputs: reshapeInputs, backend, attrs: reshapeAttrs });\n  const transposeInputs:\n  TransposeInputs = { x: paddedXReshaped };\n  const transposeAttrs:\n  TransposeAttrs = { perm:\n  permutedReshapedPaddedPermutation };\n  const paddedXT =\n  transpose({ inputs: transposeInputs, backend,\n  attrs: transposeAttrs });\n\n  const resultReshapeInputs: ReshapeInputs = { x: paddedXT };\n  const\n  resultReshapeAttrs: ReshapeAttrs = { shape: flattenShape };\n  const result = reshape(\n  { inputs:\n  resultReshapeInputs, backend, attrs: resultReshapeAttrs });\n\n  backend.disposeData(paddedX.dataId);\n  backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n\n  return\n  result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as { } as KernelFunc\n}; \n  /**\n   * @license\n   * Copyright 2020 Google\n   * LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the\n   * \"License\");\n   * you may not\n   * use this file except in compliance with the License.\n   * You may obtain a copy of the\n   * License at\n   * \n   *  
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```

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```
=====\n*\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {slice} from './Slice';\nexport function splitV(\n  args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n  const {numOrSizeSplits, axis} = attrs;\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n  const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n  const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] = s;\n    const xSlice =\n      slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n    begin[$axis] += s;\n    return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName: 'wasm',\n  kernelFunc: splitV as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====
*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n  'number', // x_id\n
'number', // alpha\n  'number', // dtype\n  'number', // out_id\n  ]);\n}\n\nfunction step(\n  args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs});\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {alpha} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  const out =
backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmStep(xId,
alpha, CppDType[x.dtype], outId);\n  return out;\n}\n\nexport const stepConfig: KernelConfig = {\n  kernelName:
Step,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: step as { } as KernelFunc\n};\n\n"/**\n *
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=====
*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
 './Reshape';\n\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,
xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
  'number', // xId\n  'array', // xStrides\n  'number', // xRank\n  'array', // beginBytes\n  'array', // endBytes\n
'array', // stridesBytes\n  'array', // outShapeBytes\n  'array', // outStridesBytes\n  'number', //
outShapeLength\n  'number', // outId\n  ]);\n}\n\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n
inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n
    newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n
    sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n
      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n      newAxisMask, shrinkAxisMask);\n\n  let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x},
backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is
memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have
rank at least 1, got: ${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n
// To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape:
finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out =
backend.makeOutput(finalShapeSparse, 'float32');\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const
xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n    const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);\n    const endBytes = new Uint8Array(new
Int32Array($end).buffer);\n    const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n    const
outputShapeBytes =\n      new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n    const outStridesBytes =
new Uint8Array(\n      new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n\n    wasmStridedSlice(\n      xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n      outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n    result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n    backend.disposeData(out.dataId);\n

```

```
}
return result;
}

export const stridedSliceConfig: KernelConfig = {
  kernelName: StridedSlice,
  backendName: 'wasm',
  setupFunc: setup,
  kernelFunc: stridedSlice as {} as KernelFunc;
};

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 */
```

```
=====
import { KernelConfig, Sub } from '@tensorflow/tfjs-core';
import { createBinaryKernelConfig } from './binary_kernel';
const supportsFullBroadcast = true;
export const subConfig: KernelConfig = {
  createBinaryKernelConfig(Sub, supportsFullBroadcast);
};

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```

```
=====
import { backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util } from '@tensorflow/tfjs-core';
import { BackendWasm } from './backend_wasm';
import { permuteAxesAndTranspose } from './kernel_utils';
import { CppDType } from './types';
let wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) => void;
function setup(backend: BackendWasm): void {
  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [
    'number', // input_id
    'number', // reduce_size
    'number', // dtype
    'number', // out_id
  ]);
  function sum(args: { backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs }): TensorInfo {
    const { backend, inputs, attrs } = args;
    const { axis, keepDims } = attrs;
    const { x } = inputs;
    const xId = backend.dataIdMap.get(x.dataId).id;
    let inputId = xId;
    let input = x;
    const { transposed, axes, originalAxes, inputWasTransposed } = permuteAxesAndTranspose(x, axis, backend);
    let reductionAxes = axes;
    if (inputWasTransposed) {
      const transposedId = backend.dataIdMap.get(transposed.dataId).id;
      if (transposedId !== xId) {
        // transpose was not a no-op. We will need to dispose of this
        // once we are done.
        input = transposed;
        inputId = transposedId;
        reductionAxes = backend_util.getInnerMostAxes(reductionAxes.length, input.shape.length);
      }
      backend_util.assertAxesAreInnerMostDims('sum', reductionAxes, input.shape.length);
      const [outShape, reduceShape] = backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);
      const reduceSize = util.sizeFromShape(reduceShape);
      const out = backend.makeOutput(outShape, input.dtype);
      if (util.sizeFromShape(input.shape) !== 0) {
        const outId = backend.dataIdMap.get(out.dataId).id;
        wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);
      }
      if (inputWasTransposed) {
        // dispose of the transposed tensor.
        backend.disposeData(transposed.dataId);
      }
      if (keepDims) {
        // reshape
        const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);
        out.shape = newShape;
      }
    }
    return out;
  }
  export const sumConfig: KernelConfig = {
    kernelName: Sum,
    backendName: 'wasm',
    setupFunc: setup,
    kernelFunc: sum as {} as KernelFunc;
  };

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   * limitations under the License.
   */
}
```

```

=====
*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/**\n * @license\n *
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```

```

=====
*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/**\n * @license\n *
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=====
*\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {CppDType} from './types';\nlet wasmTile: (\n  xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:
number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n  'number', // x_id\n  'array', // x_shape\n  'number', //
x_shape.length\n  'array', // new_shape\n  'number', // new_shape.length\n  'number' // out_id\n
]);\n}\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n  const out =
backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n  CppDType[out.dtype], outId);\n  return
out;\n}\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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```

=====
*\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppDType} from './types';\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number',
// x.shape.length\n  'number', // x.dtype\n  'number', // k\n  'bool', // sorted\n  'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n}\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,

```


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```

=====
*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { slice } from
'./Slice';\n\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n  const { inputs, backend, attrs } = args;\n  const { value } = inputs;\n  let { axis } = attrs;\n  if (axis <
0) {\n  axis += value.shape.length;\n  }\n  const numOutputs = value.shape[axis];\n  const rank =
value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;
i++) {\n  if (i !== axis) {\n  outShape[outIndex++] = value.shape[i];\n  }\n  }\n  const outs: TensorInfo[] = new
Array(numOutputs);\n  const begin = new Array(rank).fill(0);\n  const size = value.shape.slice();\n  size[axis] = 1;\n
for (let i = 0; i < outs.length; i++) {\n  begin[axis] = i;\n  outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },
backend});\n  }\n  return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n  }\n\nexport const
unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as { } as
KernelFunc,\n};\n","/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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=====
*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend:
BackendWasm }) {\n  const { inputs: { x }, backend } = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n  }\n\nexport const
zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
as { } as KernelFunc,\n};\n","/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\n// We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the
library. A modular build would replace\n// the contents of this file and import only the kernels that are
needed.\n\nimport { KernelConfig, registerKernel } from '@tensorflow/tfjs-core';\n\nimport { fusedMatMulConfig }
from './kernels/_FusedMatMul';\n\nimport { absConfig } from './kernels/Abs';\n\nimport { addConfig } from
'./kernels/Add';\n\nimport { addNConfig } from './kernels/AddN';\n\nimport { allConfig } from './kernels/All';\n\nimport
{ anyConfig } from './kernels/Any';\n\nimport { argMaxConfig } from './kernels/ArgMax';\n\nimport { avgPoolConfig }
from './kernels/AvgPool';\n\nimport { batchMatMulConfig } from './kernels/BatchMatMul';\n\nimport
{ batchToSpaceNDConfig } from './kernels/BatchToSpaceND';\n\nimport { castConfig } from './kernels/Cast';\n\nimport
{ ceilConfig } from './kernels/Ceil';\n\nimport { clipByValueConfig } from './kernels/ClipByValue';\n\nimport
{ concatConfig } from './kernels/Concat';\n\nimport { conv2DConfig } from './kernels/Conv2D';\n\nimport
{ conv2DBackpropInputConfig } from './kernels/Conv2DBackpropInput';\n\nimport { cosConfig } from
'./kernels/Cos';\n\nimport { coshConfig } from './kernels/Cosh';\n\nimport { cropAndResizeConfig } from

```

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./kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig}
from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from
./kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from
./kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from
./kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
./kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
./kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
./kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
./kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
./kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
./kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
./kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
./kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
./kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
./kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
./kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n

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logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n
minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n
nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n
onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n
realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n
rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n
sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n
squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n
tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n
zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n  'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n    0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n    2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n  ]));\n\n**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n  return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n  new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n  // This typed array is a WebAssembly
program containing threaded\n  // instructions.\n  return WebAssembly.validate(new Uint8Array([\n    0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n    4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n  ]));\n } catch (e) {\n  return false;\n };\n\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(\nfunction(WasmBackendModuleThreadedSimd) {\n  WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new

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Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=("./this.program");var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"];var scriptDirectory=""};function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"^")}arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=="undefined" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("^")+1)}else{scriptDirectory=""}}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return

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xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("\perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments\"])arguments_=Module["arguments"];if(Module["thisProgram\"])thisProgram=
Module["thisProgram"];if(Module["quit\"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary\"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func, "Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str="";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx

```

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++|=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors()
}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
if(dependenciesFulfilled){var

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callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("\nPthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what="\nabort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency("\nwasm-
instantiate")})))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("\nwasm-instantiate")}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("\nfailed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("\nwasm streaming compile failed: "+reason);err("\nfalling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("\nModule.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var
ASM_CONSTS={10520:function(){throw"Canceled!"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==="function"){callback(Module);continue}var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E

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BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOCSSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
_emsripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emsripten_futex_wake\"]=_emsripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\": \"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emsripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emsripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},t

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hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.length>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.store(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscripten_futex_wake(tb+0,2147483647);_emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHREAD){postMessage({"cmd":"exit"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthread_self(),-1);postMessage({"cmd":"cancelDone"})},terminateAllThreads:function(){for(var t in PThread.pthreads){var pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThread.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeThreadData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(function(){delete PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=undefined}),runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,onFinishedLoading){worker.onmessage=function(e){var d=e["data"];var cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){var thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"])}else{console.error('Internal error! Worker sent a message \''+cmd+'\' to target pthread '+d["targetThread"]+', but that thread no longer exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd==="processQueuedMainThreadWork"){_emscripten_main_thread_process_queued_calls()}else if(cmd==="spawnThread"){spawnThread(e.data)}else if(cmd==="cleanupThread"){cleanupThread(d["thread"])}else if(cmd==="killThread"){killThread(d["thread"])}else if(cmd==="cancelThread"){cancelThread(d["thread"])}else if(cmd==="loaded"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread){worker.runPthread();delete worker.runPthread}}else if(cmd==="print"){out("Thread "+d["threadId"]+" "+d["text"])}else if(cmd==="printErr"){err("Thread "+d["threadId"]+" "+d["text"])}else if(cmd==="alert"){alert("Thread "+d["threadId"]+" "+d["text"])}else if(cmd==="exit"){var detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if(detached){PThread.returnWorkerToPool(worker)}else if(cmd==="exitProcess"){try{exit(d["returnCode"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else if(cmd==="cancelDone"){PThread.returnWorkerToPool(worker)}else if(cmd==="objectTransfer"){PThread.receiveObjectTransfer(e.data)}else if(e.data.target==="setimmediate"){worker.postMessage(e.data)}else{err("worker sent an unknown command

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\'+cmd))PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\'pthread sent
an error! \'+e.filename+\':\'+e.lineno+\'':
\'+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\'message\',function(data){worker.onmessage({data:d
ata}});worker.on(\'error\',function(data){worker.onerror(data)});worker.on(\'exit\',function(data){})}worker.post
Message({\'cmd\':\'load\',\'urlOrBlob\':Module[\'mainScriptUrlOrBlob\']|_scriptDir,\'wasmMemory\':wasmMe
memory,\'wasmModule\':wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\'tfjs-
backend-wasm-threaded-simd.worker.js\');PThread.unusedWorkers.push(new
Worker(pthreadMainJs)},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\'establishStackSpace\']=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\'getNoExitRuntime\']=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module[\'invokeEntryPoint\']=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\'Assertion failed: \'+UTF8ToString(condition)+\' at:
\'+[filename?UTF8ToString(filename):\'unknown filename\',line,func?UTF8ToString(func):\'unknown
function\'])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\'hrtime\']();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\'__performance_now_clock_drift\']}}else if(typeof
dateNow!=="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\'cmd\':\'processQueuedMainThreadWork\'})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\'targetThread\':targetThreadId,\'cmd\':\'processThreadQueu
e\'})}else{var pthread=PThread.threads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\'cmd\':\'processThreadQueue\'})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret==="timed-out")return-
73;if(ret==="not-equal")return-6;if(ret==="ok")return 0;throw\'Atomics.wait returned an unexpected value
\'+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function

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_emsripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emsripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("os").cpus().length;return
navigator["hardwareConcurrency"]}function _emsripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emsripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);return
ret}var _emsripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emsripten_receive_on_main_thread_js(index,numCallArgs,args){_emsripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emsripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emsripten_receive_on_main_thread_js_callArgs)}function
_emsripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emsripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emsripten_resize_heap(requestedSize){var
oldSize=_emsripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emsripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--

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)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=\"undefined\"?document:0,typeof window!=\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var

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targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1 }else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension("\ANGLE_instanced_arrays");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ext
t["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};
return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension("\OES_vertex_array_object");if(ext){ctx["createVertexArray"]=function(){return
ext["createVertexArrayOES"]();ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension("\WEBGL_draw_buffers");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffers
WEBGL"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension("\WEBGL_multi_dra
w"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source="";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("\webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\undefined\||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\object")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f

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function(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtensionsDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_object(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("
EXT_disjoint_timer_query");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("lose_context")<0&&ext.indexOf("debug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-1)!="\"){name=name.slice(0,name.lastIndexOf("\\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\\"+j+"\\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}};var __emscripten_webgl_power_preferences=["default","low-power","high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
__fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function __fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
__fd_write(fd,iow,iocnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iow,iocnt,pnum);var num=0;for(var i=0;i<iocnt;i++){var
ptr=GROWABLE_HEAP_I32()[iow+i*8>>2];var len=GROWABLE_HEAP_I32()[iow+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8)[ptr+j]}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function __pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
__pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal

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error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd\\":\\"run\\",\\"start_routine\\":threadParams.startRoutine,\\"arg\\":threadParams.arg,\\"threadInfoStruct\\":thre
adParams.pthread_ptr,\\"stackBase\\":threadParams.stackBase,\\"stackSize\\":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\\"undefined\\"){err(\\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\\");return
6}if(!pthread_ptr){err(\\"pthread_create called with a null thread pointer!\\");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd=\\\"spawnThread\\\";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw\\"Canceled!\"}function
_emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\\"Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\\");}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err(\\"pthread_join attempted on a null thread
pointer!\\");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()===thread){err(\\"PThread
\\\"+thread+\\\" is attempting to join to itself!\\");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()===thread){err(\\"Main thread

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\'+thread+\'' is attempting to join to itself!\');return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\'pthread_join attempted on thread
\' +thread+\', which does not point to a valid thread, or does not exist anymore!\');return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\'Attempted to join thread
\' +thread+\', which was already detached!\');return
ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus===1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({\'cmd\':\'cleanupThread\',\'thread\':thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thre
ad_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\'object\')return navigator[\'hardwareConcurrency\']||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\'e\':__assert_fail,\'r\':__call_main,\'x\':_emscripten_notify_thread_queue,\'b\':_abort,\'y\':
_emscripten_asm_const_int,\'j\':_emscripten_conditional_set_current_thread_status,\'d\':_emscripten_futex_wait,
\'c\':_emscripten_futex_wake,\'f\':_emscripten_get_now,\'p\':_emscripten_memcpy_big,\'A\':_emscripten_num_l
ogical_cores,\'u\':_emscripten_receive_on_main_thread_js,\'q\':_emscripten_resize_heap,\'v\':_emscripten_set_ca
nvas_element_size,\'i\':_emscripten_set_current_thread_status,\'s\':_emscripten_set_thread_name,\'w\':_emscript
en_webgl_create_context,\'l\':_fd_close,\'n\':_fd_seek,\'g\':_fd_write,\'o\':initPthreadsJS,\'a\':wasmMemory|Mo
dule[\'wasmMemory\'],\'z\':_pthread_cleanup_pop,\'k\':_pthread_cleanup_push,\'h\':_pthread_create,\'m\':_pthr
ead_join,\'t\':_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\'__wasm_call_ctors\']=function(){return(__wasm_call_ctors=Module[\'__wasm
_call_ctors\']=Module[\'asm\']["B"]).apply(null,arguments)};var
_init=Module[\'_init\']=function(){return(_init=Module[\'_init\']=Module[\'asm\']["C"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\'_init_with_threads_count\']=function(){return(_init_with_threads_count=Mod
ule[\'_init_with_threads_count\']=Module[\'asm\']["D"]).apply(null,arguments)};var
_get_threads_count=Module[\'_get_threads_count\']=function(){return(_get_threads_count=Module[\'_get_threads

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_count"]=Module["asm\"][["E\"]).apply(null,arguments)};var
_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=Module["asm\"][["F\"]).apply(null,arguments)};var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm\"][["G\"]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm\"][["H\"]).apply(null,arguments)};var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm\"][["J\"]).apply(null,arguments)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm\"][["K\"]).apply(null,arguments)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm\"][["L\"]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm\"][["M\"]).apply(null,arguments)};var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm\"][["N\"]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm\"][["O\"]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm\"][["P\"]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm\"][["Q\"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm\"][["R\"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm\"][["S\"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm\"][["T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm\"][["U\"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm\"][["V\"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm\"][["W\"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm\"][["X\"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm\"][["Y\"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm\"][["Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm\"][["_"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm\"][["$"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm\"][["aa"]]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm\"][["ba"]]).apply(null,argument

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s});var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][_"da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][_"ga"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["asm"][_"ha"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][_"ia"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][_"ja"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][_"ka"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][_"la"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][_"ma"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"na"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ta"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"ua"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"za"]).apply(null,arguments)};

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ts});var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["Ea"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["Ha"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["La"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Va"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Xa"]]).apply(n

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ull,arguments));var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"][["Ya"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Za"]]).apply(null,argume
nts)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"][["_a"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["$a"]]).apply(null,argument
s)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,argume
nts)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,argument
s)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,argu
ments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,argument
s)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,ar
guments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["f
b"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["g
b"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(nul
l,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments
)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"][["kb"]]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global
_libc=Module["_emscripten_get_global_libc"]=Module["asm"][["lb"]]).apply(null,arguments)};var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["as
m"][["mb"]]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=M
odule["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_que
ued_calls"]=Module["asm"][["ob"]]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]
=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_proc
ess_queued_calls"]=Module["asm"][["pb"]]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_
id"]=Module["asm"][["qb"]]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_ems
cripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"][["rb"]]).app

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ly(null,arguments));var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments)};var
__emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){retur
n(__emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\
\"][\"tb\"]).apply(null,arguments)};var
__emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(
){return(__emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_t
hread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
__emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(__emscripten_tls_init=Module[\"_emscrip
ten_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Mod
ule[\"_emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\
\"][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\
\"]).apply(null,arguments)};var
__emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(__emscripten_stack_set
limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
__memalign=Module[\"_memalign\"]=function(){return(__memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb
\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=1
0512;var
__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\");},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\":\"exitProcess\", \"returnCode\":status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunTi
me();if(Module[\"onExit\"]Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run

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readyPromiseResolve,readyPromiseReject;Module[\'ready\']=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.\/this.program\';var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\'object\';ENVIRONMENT_IS_WORKER=typeof
importScripts===\'function\';ENVIRONMENT_IS_NODE=typeof process===\'object\'&&typeof
process.versions===\'object\'&&typeof
process.versions.node===\'string\';ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\'\';function
locateFile(path){if(Module[\'locateFile\']){return Module[\'locateFile\'](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\'path\').
dirname(scriptDirectory)+\'/\'}else{scriptDirectory=__dirname+\'/\'}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\'fs\');if(!nodePath)nodePath=require(\'path\');filename=n
odePath[\'normalize\'](filename);return
nodeFS[\'readFileSync\'](filename,binary?null:\'utf8\');}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\'argv\'].length>1){thisProgram=process[\'argv\'][1].replace(/\\/g,\'/\')}arguments_=process[\'arg
v\'].slice(2);process[\'on\'](\\'uncaughtException\',function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\'on\'](\\'unhandledRejection\',abort);quit_=function(status){process[\'exit\'](status)};Module[\'insp
ect\']=function(){return[\'Emscripten Module object\']}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\'function\'){return new
Uint8Array(readbuffer(f))}data=read(f,\'binary\');assert(typeof data===\'object\');return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\'function\'){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\"){if(typeof
console===\'undefined\')console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\'&&document.currentScript){scriptDirectory=document.currentScript.src;if(_scriptDir){s
criptDirectory=_scriptDir;if(scriptDirectory.indexOf(\'blob:\')!=\"0\"){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\'/\')+1)}else{scriptDirectory=\'\'}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\'GET\',url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\'GET\',url,false);xhr.responseType=\'arraybuffer\';xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\'GET\',url,true);xhr.responseType=\'arraybuffer\';xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{var
out=Module[\'print\']||console.log.bind(console);var err=Module[\'printErr\']||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\'arguments\'])arguments_=Module[\'arguments\'];if(Module[\'thisProgram\'])thisProgram=

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Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},array:function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new

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Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"]((runDependencies))}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]((runDependencies))if(runDepen
dencies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort(\n"+what+"\n). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)}))}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil

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e)&&typeof fetch===\"function\")}{return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function
_emscipten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscipten_get_heap_size(){return HEAPU8.length}function
emscipten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscipten_resize_heap(requestedSize){var oldSize=_emscipten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscipten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var
i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _thread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
asmLibraryArg={\"a\":_abort,\"d\":_emscipten_memcpy_big,\"e\":_emscipten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_thread_create,\"g\":_thread_join,\"i\":_sysconf};var asm=createWasm();var

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__wasm_call_ctors=Module["__wasm_call_ctors"]=function(){return(__wasm_call_ctors=Module["__wasm
_call_ctors"]=Module["asm"]["k"]).apply(null,arguments)};var
_init=Module["_init"]=function(){return(_init=Module["asm"]["l"]).apply(null,arguments)};
var
_init_with_threads_count=Module["_init_with_threads_count"]=function(){return(_init_with_threads_count=Mod
ule["_init_with_threads_count"]=Module["asm"]["m"]).apply(null,arguments)};var
_get_threads_count=Module["_get_threads_count"]=function(){return(_get_threads_count=Module["_get_threads
_count"]=Module["asm"]["n"]).apply(null,arguments)};var
_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=M
odule["asm"]["o"]).apply(null,arguments)};var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm"
]["p"]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm"]["q"]).apply(n
ull,arguments)};var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"]["s"]).apply(null,arguments
)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"]["t"]).apply(null,argument
s)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"]["u"]).apply(null,ar
guments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"]["v"]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"]["w"]).apply(null,argumen
ts)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"]["x"]).app
ly(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"]["y"]).a
pply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Modu
le["asm"]["z"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["A"]).apply(null,argument
s)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["
asm"]["B"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["C"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Modul
e["_Conv2DBackpropInput"]=Module["asm"]["D"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["E"]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["F"]).apply(null,argu
ments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=
Module["asm"]["G"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["H"]).a
pply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=M
odule["asm"]["I"]).apply(null,arguments)};var

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_DeepwiseConv2dNative=Module["_DeepwiseConv2dNative"]=function(){return(_DeepwiseConv2dNative=Module["_DeepwiseConv2dNative"]=Module["asm"]["J"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"]["N"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]["Q"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]["R"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]["S"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["T"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["U"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["V"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["W"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["X"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["Y"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["Z"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["_"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"]["$"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["aa"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["ba"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["ca"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["da"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["ea"]).apply(null,arguments)};var

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_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["ga"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["ia"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["la"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["na"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["oa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["pa"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["qa"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["ra"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["sa"]]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["ta"]]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments)};var

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_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][_"Da"]).apply(null,arguments)
};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][_"Ea"]).ap
ply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][_"Fa"]).apply(null,argumen
ts)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][_"Ga"]).apply(nu
ll,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][_"Ia"]).apply(null,argume
nts)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"][_"Ja"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][_"Ka"]).apply(null,argument
s)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][_"La"]).apply(null,argum
ents)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][_"Ma"]).apply(null,argumen
ts)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][_"Na"]).apply(null,argu
ments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][_"Oa"]).apply(null,argumen
ts)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][_"Pa"]).apply(null,ar
guments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][_"
Qa"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][_"R
a"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"][_"Sa"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][_"Ta"]).apply(nu
ll,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][_"Ua"]).apply(null,argument
s)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"][_"Va"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][_"Wa"]).
apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][_Xa"]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][_"Ya"
]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name=_"ExitStatus";this.message=_"Program terminated with
exit(\"+status+\")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function

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Blob([response], { type: 'application/javascript'});\n    return URL.createObjectURL(blob);\n  }\n\n  if
(path.endsWith('.wasm')) {\n    return getPathToWasmBinary(\n      simdSupported as boolean,
threadsSupported as boolean,\n      wasmPathPrefix != null ? wasmPathPrefix : prefix);\n  }\n  return prefix
+ path;\n  };\n\n  // Use the instantiateWasm override when system fetch is not available.\n  // Reference:\n  //
https://github.com/emscripten-core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n  factoryConfig.instantiateWasm =\n  createInstantiateWasmFunc(getPathToWasmBinary(\n    simdSupported as boolean, threadsSupported as
boolean,\n    wasmPathPrefix != null ? wasmPathPrefix : ''));\n  }\n\n  let initialized = false;\n
factoryConfig.onAbort = () => {\n    if (initialized) {\n      // Emscripten already called console.warn so no need to
double log.\n      return;\n    }\n    if (initAborted) {\n      // Emscripten calls `onAbort` twice, resulting in double
error\n      // messages.\n      return;\n    }\n    initAborted = true;\n    const rejectMsg =\n      'Make sure the
server can serve the `.wasm` file relative to the ' +\n      'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n
reject({message: rejectMsg});\n  };\n\n  let wasm: Promise<BackendWasmModule>;\n  // If `wasmPath` has
been defined we must initialize the vanilla module.\n  if (threadsSupported && simdSupported && wasmPath ==
null) {\n    factoryConfig.mainScriptUrlOrBlob = new Blob([\n      [var WasmBackendModuleThreadedSimd = `
+\n      wasmFactoryThreadedSimd.toString()],\n      { type: 'text/javascript'}];\n    wasm =
wasmFactoryThreadedSimd(factoryConfig);\n  } else {\n    // The wasmFactory works for both vanilla and SIMD
binaries.\n    wasm = wasmFactory(factoryConfig);\n  }\n\n  // The WASM module has been successfully
created by the factory.\n  // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n    initialized = true;\n    initAborted = false;\n\n    const voidReturnType: string =
null;\n    // Using the tfjs namespace to avoid conflict with emscripten's API.\n    module.tfjs = {\n      init:
module.cwrap('init', null, []),\n      initWithThreadsCount:\n        module.cwrap('init_with_threads_count', null,
['number']),\n      getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n      registerTensor:
module.cwrap(\n        'register_tensor', null,\n        [\n          'number', // id\n          'number', // size\n
          'number', // memoryOffset\n        ]),\n      disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n      dispose: module.cwrap('dispose', voidReturnType, []),\n    };\n\n    resolve({wasm: module});\n
  });\n  });\n\nfunction typedArrayFromBuffer(n  buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n  switch (dtype) {\n    case 'float32':\n      return new Float32Array(buffer);\n    case
'int32':\n      return new Int32Array(buffer);\n    case 'bool':\n      return new Uint8Array(buffer);\n    default:\n
throw new Error(`Unknown dtype ${dtype}`);\n  }\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-wasm.wasm',
'tfjs-backend-wasm-simd.wasm',\n  'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ntype
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * \n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*\n * export function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n    ' ' will be removed in a future release.);\n  if
(initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call ' +\n
      ' `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n  }\n  wasmPath = path;\n  customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * \n * ```js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
```\n * \n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory

```

where the WASM binaries are located.  
 \* Note that this prefix will be used to load each binary (vanilla, SIMD-enabled, threading-enabled, etc.).  
 \* - (object) Mapping from names of WASM binaries to custom full paths specifying the locations of those binaries. This is useful if your WASM binaries are not all located in the same directory, or if your WASM binaries have been renamed.  
 \* @param usePlatformFetch optional boolean to use platform fetch to download the wasm file, default to false.  
 \* @doc {heading: 'Environment', namespace: 'wasm'}  
 ^\nexport function setWasmPaths(prefixOrFileMap: string | {[key in WasmBinaryName]?: string}, usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error('The WASM backend was already initialized. Make sure you call ' + prefixOrFileMap + `setWasmPaths()` before you call `tf.setBackend()` or ' + prefixOrFileMap + `tf.ready()`');\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix = prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new Error('There were no entries found for the following binaries: ` + missingPaths.join(',') + `'. Please either call setWasmPaths with a ` + prefixOrFileMap + `map providing a path for each binary, or with a string indicating ` + prefixOrFileMap + `the directory where all the binaries can be found.`');\n }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/\*\*  
 Used in unit tests.  
 ^\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/\*\*  
 \* Sets the number of threads that will be used by XNNPACK to create a threadpool (default to the number of logical CPU cores).  
 \* This must be called before calling `tf.setBackend('wasm')`.  
 ^\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/\*\*  
 \* Gets the actual threads count that is used by XNNPACK.  
 \* It is set after the backend is initialized.  
 ^\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n throw new Error('WASM backend not initialized.);\n }\n return actualThreadsCount;\n}\n\n"/\*\* @license See the LICENSE file. \*/  
 ^\n\n// This code is auto-generated, do not modify this file!  
 \nconst version = '3.11.0';  
 ^\nexport {version};  
 \n"/\*\* @license  
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 \n

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^
\nimport './flags_wasm';
\nimport {registerBackend} from '@tensorflow/tfjs-core';
\nimport {BackendWasm, init} from './backend_wasm';
\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';
\nexport {version as version_wasm} from './version';
\nconst WASM_PRIORITY = 2;
\nregisterBackend('wasm', async () => {\n const {wasm} = await init();
\n return new BackendWasm(wasm);\n}, WASM_PRIORITY);
\n], "names": ["_FusedMatMul", "util", "Abs", "backend_util", "Add", "AddN", "Identity", "setup", "Transpose", "All", "Any", "wasmFunc", "ArgMax", "AvgPool", "Reshape", "BatchMatMul", "slice_util", "buffer", "sliceImplCPU", "Slice", "BatchToSpaceND", "Cast", "Ceil", "ClipByValue", "concatImplCPU", "Concat", "Conv2D", "Conv2DBackpropInput", "Cos", "Cosh", "CropAndResize", "Cumsum", "DepthToSpace", "DepthwiseConv2dNative", "Elu", "supportsFullBroadcast", "Equal", "Exp", "ExpandDims", "Fill", "FlipLeftRight", "Floor", "FloorDiv", "FusedBatchNorm", "FusedConv2D", "FusedDepthwiseConv2D", "GatherNd", "gather_util", "GatherV2", "Greater", "GreaterEqual", "setupFunc", "LeakyRelu", "Less", "LessEqual", "Log", "LogicalAnd", "Max", "Maximum", "MaxPool", "Mean", "Min", "Minimum", "MirrorPad", "Multiply", "Neg", "NonMaxSuppressionV3", "NonMaxSuppressionV4", "NonMaxSuppressionV5", "kernelFunc", "NotEqual", "OneHot", "OnesLike", "Pack", "PadV2", "Pow", "Prelu", "Prod", "rangeImplCPU", "Range", "RealDiv", "Relu", "Relu6", "ResizeBilinear", "Reverse", "RotateWithOffset", "Round", "Rsqrt", "ScatterNd", "scatter_util", "Select", "Sigmoid", "Sin", "Softmax", "SpaceToBatchND", "SplitV", "Sqrt", "Square", "SquaredDifference", "Step", "StridedSlice", "Sub", "Sum", "Tan", "Tanh", "Tile", "TopK", "Transform", "Unpack", "ZerosLike", "registerKernel", "env"

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, "require\$\$0", "require\$\$1", "require\$\$2", "global", "require\$\$3", "require\$\$4", "KernelBackend", "DataStorage", "engine", "wasmFactoryThreadedSimd", "wasmFactory", "deprecationWarn", "registerBackend"], "mappings": ";;;;;;;;;;;;;EAAA;;;;;;;;;;;;;EAIbA;EACA,IAAY,QAMX;EAND,WAAy,QAAQ;MACIB,6CAAW,CAAA;MACX,yCAAS,CAAA;MACT,uCAAQ,CAAA;MACR,2CAAU,CAAA;MACV,iDAAa,CAAA;EACf,CAAC,EANW,QAAQ,KAAr,QAAQ,QAMnB;EAED;EACA,IAAY,iBAQX;EARD,WAAy,iBAAiB;MAC3B,6DAAU,CAAA;MACV,yDAAQ,CAAA;MACR,2DAAS,CAAA;MACT,2DAAS,CAAA;MACT,mEAAa,CAAA;MACb,+DAAW,CAAA;MACX,uDAAO,CAAA;EACT,CAAC,EARW,iBAAiB,KAajB,iBAAiB;;EC3B7B;;;;;;;;;;;;;EAuBA,IAAI,eAKQ,CAAC;EAEb,SAAS,KAak,CAAC,OAAoB;MACjC,eAAe,GAAG,OAAO,CAAC,IAAI,CAAC,KAak,CAACA,qBAAy,EAAE,IAAI,aAAa;UACIE,QAAQ;UACR,OAAO;UACP,QAAQ;UACR,QAAQ;UACR,OAAO;UACP,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;OACT,CAAC,CAAC;EAcl,CAAC;EAED,SAAS,gBAAgB,CAAC,IAIzB;MACC,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAak,EAAC,GAAG,IAAI,CAAC;MACtC,MAAM,EAAC,CAAC,EAAE,CAAC,EAAE,IAAI,EAAE,sBAAsB,EAAC,GAAG,MAAM,CAAC;MAEpD,IAAI,CAAC,CAAC,KAak,KAak,SAAS,IAAI,CAAC,CAAC,KAak,KAak,SAAS,EAAE;UACID,MAAM,IAAI,KAak,CACX,6DAA6D,CAAC,CAAC;OACpE;MAED,MAAM,EAAC,UAAU,EAAE,UAAU,EAAE,UAAU,EAAE,cAAc,EAAC,GAAG,KAak,CAAC;MACnE,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAC/C,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAE/C,IAAI,MAAM,GAAG,CAAC,CAAC;MACf,IAAI,IAAI,IAAI,IAAI,EAAE;UACHb,MAAM,QAAQ,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,IAAI,CAAC,MAAM,CAAC,CAAC;UACpd,IAAI,QAAQ,CAAC,KAak,CAAC,MAAM,KAak,CAAC,EAAE;cAC/B,MAAM,IAAI,KAak,CACX,iDAAiD;kBACjD,QAAQ,QAAQ,CAAC,KAak,CAAC,MAAM,GAAG,CAAC,CAAC;WAcvC;UACD,MAAM,GAAG,QAAQ,CAAC,EAAE,CAAC;OACtB;MACD,MAAM,wBAawB,GAAG,sBAAsB,IAAI,IAAI;UAC3D,CAAC;UACD,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,sBAAsB,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAC5D,MAAM,eAAe,GACjB,iBAAiB,CAAC,UAAkD,CAAC,CAAC;MAC1E,IAAI,eAAe,IAAI,IAAI,EAAE;UAC3B,MAAM,IAAI,KAak,CACX,GAAG,UAAU,gDAAgD;cAC7D,sBAAsB,CAAC,CAAC;OAC7B;MAED,MAAM,OAAO,GAAG,UAAU,GAAG,CAAC,CAAC,KAak,CAAC,CAAC,GAAG,CAAC,CAAC,KAak,CAAC,CAAC,CAAC;MACrD,MAAM,QAAQ,GAAG,UAAU,GAAG,CAAC,CAAC,KAak,CAAC,CAAC,CAAC,GAAG,CAAC,CAAC,KAak,CAAC,CAAC,CAAC;MACtD,MAAM,QAAQ,GAAG,CAAC,CAAC,KAak,CAAC,CAAC,CAAC,CAAC;MAE5B,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,QAAQ,EAAE,OAAO,EAAE,QAAQ,CAAC,EAAE,CAAC,CAAC,KAak,CAAC,CAAC;MACvE,MAAM,KAak,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,MAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAak,CAAC,CAAC,MAAM,CAAC,CAAC;MACnE,MAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAak,CAAC,CAAC,MAAM,CAAC,CAAC;MAEnE,eAAe,CACX,GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAak,CAAC,MAAM,EAAE,GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAak,CAAC,MAAM,EAAC,IAAI,UAAU,UAAU,EAAE,eAAe,EAAE,MAAM,EAAE,wBAawB,EACzE,cAAc,IAAI,CAAC,EAAE,KAak,CAAC,CAAC;MAEhC,OAAO,GAAG,CAAC;EAcB,CAAC;EAEM,MAAM,iBAAiB,GAAiB;MAC7C,UAAU,EAAEA,qBAAy;MACxB,WAAW,EAAE,MAAM;MACnB,SAAS,EAAE,KAak;MACHb,UAAU,EAAE,gBAAoC;GACjD;;EC7GD;;;;;;;;;;;;;WauBgB,uBAAuB,CACnC,UAAkB,EAAE,OAAkB;MACxC,IAAI,QAA6D,CAAC;MAEIE,SAAS,SAAS,CAAC,OAAoB;UACrC,QAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAak,CAAC,UAAU,EAAE,IAAI,aAAa;cACzD,QAAQ;cACR,QAAQ;cACR,QAAQ;WACT,CAAC,CAAC;OACJ;MAED,SAAS,UAAU,CAAC,IAAiD;UAEhE,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,EAAC,CAAC,EAAC,EAAC,GAAG,IAAI,CAAC;UACpC,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;UAC/C,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,CAAC,KAak,EAAE,OAAO,IAAI,CAAC,CAAC,KAak,CAAC,CAAC;UAC5D,MAAM,KAak,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;;UAGnD,IAAIC,aAAI,CAAC,aAAa,CAAC,GAAG,CAAC,KAak,CAAC,KAak,CAAC,EAAE;cACvC,OAAO,GAAG,CAAC;WACZ;UAED,QAAQ,CAAC,GAAG,EAAE,QAAQ,CAAC,CAAC,CAAC,KAak,CAAC,EAAE,KAak,CAAC,CAAC;UACxC,OAAO,GAAG,CAAC;OACZ;MAED,OAAO,EAAC,UAAU,EAAE,WAA

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CAAC,MAAM,CAAC,EAAE,KAAK,CAAC,CAAC;MACvD,MAAM,OAAO,GAAG,OAAO,CAAC,kBAaKB,CAAC,GAAG,CAAC,CAAC;MACHD,OAAO,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC;MACpB,OAAO,GAAG,CAAC;EACb,CAAC,CAAC;EAEC,MAAM,WAAW,GAAiB;MACvC,UAAU,EAAEC,cAAK;MACjB,WAAW,EAAE,MAAM;MACnB,UAAU,EAAE,KAAyB;GACtC;;ECTCD;,,,,,,,,,,,,,EAqBA,MAAM5C,uBAAqB,GAAG,IAAI,CAAC;EAC5B,MAAM,aAAa,GACtB,wBAAwB,CAAC6C,gBAAO,EAAE7C,uBAAqB,CAAC;;ECvB5D;,,,,,;,,,,,;EAmBO,MAAM,UAAU,GAAiB,uBAAuB,CAAC8C,aAAI,CAAC;;ECnBrE;,,,,,;,,,,,;EAmBO,MAAM,WAAW,GAAiB,uBAAuB,CAACC,cAAK,CAAC;;ECnBvE;,,,,,;,,,,,;EAuBA,IAAI,kBAGsE,CAAC;EAE3E,SAAS3E,OAAK,CAAC,OAAoB;MACjC,kBAaKB,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC4E,uBAAc,EAAE,IAAI,WAAW;UACrE,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;OACT,CAAC,CAAC;EAEL,CAAC;EAED,SAAS,cAAc,CAAC,IAIvB;MACC,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;MAEtC,MAAM,EAAC,MAAM,EAAC,GAAG,MAAM,CAAC;MACxB,MAAM,EAAC,YAAy,EAAE,gBAAgB,EAAE,IAAI,EAAC,GAAG,KAAK,CAAC;MACrD,MAAM,CAAC,SAAS,EAAE,QAAQ,CAAC,GAAG,IAAI,CAAC;MAEnC,MAAM,CAAC,KAAK,EAAE,SAAS,EAAE,QAAQ,EAAE,WAAW,CAAC,GAAG,MAAM,CAAC,KAAK,CAAC;MAC/D,MAAM,QAAQ,GAAG,CAAC,KAAK,EAAE,SAAS,EAAE,QAAQ,EAAE,WAAW,CAAC,CAAC;MAE3D,IAAI,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,MAAM,CAAC,MAAM,CAAC,CAAC;MACjD,IAAI,UAAU,CAAC;MACf,IAAI,KAAK,CAAC,KAAK,KAAK,SAAS,EAAE;UAC7B,UAAU;cACN,IAAI,CAAC,EAAC,OAAO,EAAE,MAAM,EAAE,EAAC,CAAC,EAAE,MAAM,EAAC,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,SAAS,EAAC,EAAC,CAAC,CAAC;UACpE,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;OACID;MACD,MAAM,GAAG,GAAG,KAAK,CAAC,EAAE,CAAC;MAErB,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,QAAQ,EAAE,SAAS,CAAC,CAAC;MACpD,IAAIIF,aAAI,CAAC,aAAa,CAAC,MAAM,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;UAC1C,OAAO,GAAG,CAAC;OACZ;MACD,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,kBAaKB,CACd,GAAG,EAAE,KAAK,EAAE,SAAS,EAAE,QAAQ,EAAE,WAAW,EAAE,SAAS,EAAE,QAAQ,EACjE,YAAy,GAAG,CAAC,GAAG,CAAC,EAAE,gBAAgB,GAAG,CAAC,GAAG,CAAC,EAAE,KAAK,CAAC,CAAC;MAE3D,IAAI,UAAU,IAAI,IAAI,EAAE;UACtB,OAAO,CAAC,WAAW,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;OACxC;MAED,OAAO,GAAG,CAAC;EACb,CAAC;EAEM,MAAM,oBAAoB,GAAiB;MACHD,UAAU,EAAEkF,uBAAc;MAC1B,WAAW,EAAE,MAAM;MACnB,SAAS,EAAE5E,OAAK;MACHB,UAAU,EAAE,cAAkC;GAC/C;;ECxFD;,,,,,;,,,,,;EAwBA,IAAI,WAE8C,CAAC;EAEnD,SAASA,OAAK,CAAC,OAAoB;MACjC,WAAW,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC6E,gBAAO,EAAE,IAAI,EAAE;UAC9C,QAAQ;UACR,OAAO;UACP,QAAQ;UACR,OAAO;UACP,QAAQ;UACR,QAAQ;OACT,CAAC,CAAC;EAEL,CAAC;WAEe,OAAO,CACnB,IAAwE;MAE1E,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;MACtC,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;MACnB,MAAM,EAAC,IAAI,EAAC,GAAG,KAAK,CAAC;MAErB,MAAM,IAAI,GAAGnF,aAAI,CAAC,cAAc,CAAC,IAAI,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;MAEhD,IAAI,CAAC,CAAC,KAAK,CAAC,MAAM,KAAK,CAAC,EAAE;UACxB,OAAO,QAAQ,CAAC,EAAC,MAAM,EAAE,EAAC,CAAC,EAAC,EAAE,OAAO,EAAC,CAAC,CAAC;OACzC;MAED,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,CAAC,KAAK,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;MACjD,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAC/C,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,MAAM,SAAS,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,IAAI,CAAC,CAAC,MAAM,CAAC,CAAC;MAC9D,MAAM,aAAa,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAK,CAAC,CAAC,MAAM,CAAC,CAAC;MAErE,WAAW,CACP,GAAG,EAAC,SAAS,EAAE,IAAI,CAAC,MAAM,EAAE,aAAa,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,KAAK,CAAC,CAAC;MAEvE,MAAM,QAAQ,GACV,OAAO,CAAC,EAAC,MAAM,EAAE,EAAC,CAAC,EAAE,GAAG,EAAC,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,CAAC,CAAC,KAAK,EAAC,EAAE,OAAO,EAAC,CAAC,CAAC;MAE1E,OAAO,CAAC,WAAW,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC;MACHC,OAAO,QAAQ,CAAC;EACIB,CAAC;EAEM,MAAM,aAAa,GAAiB;MACzC,UAAU,EAAEmF,gBAAO;MACnB,WAAW,EAAE,MAAM;MACnB,UAAU,EAAE,OAA2B;MACvC,SAAS,EAAE7E,OAAK;GACjB;;EC1ED;,,,,,;,,,,,;EAsBA,IAAI,U



C,KAAK,CAAC,CAAC;MACjD,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,MAAM,KAAK,GAAG,SAAS,CAAC,KAAK,CAAC,MAAM,CAAC;MACrC,MAAM,KAAK,GAAG,CAAC,CAAC,KAAK,CAAC,MAAM,CAAC;MAE7B,MAAM,MAAM,GAAG,KAAK,KAAK,CAAC,IAAI,KAAK,GAAG,CAAC,IAAI,KAAK,KAAK,CAAC;UACID,CAAC;UACDN,aAAI,CAAC,aAAa,CAAC,CAAC,CAAC,KAAK,CAAC,KAAK,CAAC,CAAC,CAAC,CAAC,CAAC;MAEzC,UAAU,CAAC,WAAW,EAAE,GAAG,EAAE,GAAG,EAAE,MAAM,EAAE,KAAK,CAAC,CAAC;MACjD,OAAO,GAAG,CAAC;EACb,CAAC;EAEM,MAAM,YAAY,GAAiB;MACxC,UAAU,EAAEYf,eAAM;MACIB,WAAW,EAAE,MAAM;MACnB,UAAU,EAAE,MAA0B;MACtC,SAAS,EAAEnF,OAAK;GACjB;;EC7DD;;;;;;;EAqBA,IAAII,UAA8C,CAAC;EAEnD,SAASJ,OAAK,CAAC,OAAoB;MACjCI,UAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAACgF,gBAAO,EAAE,IAAI,aAAa,CAAC,QAAQ,EAAE,QAAQ,CAAC,CAAC,CAAC;EACbF,CAAC;EAED,SAAS,OAAO,CAAC,IAAmD;MAEIE,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,EAAC,CAAC,EAAC,EAAC,GAAG,IAAI,CAAC;MACpC,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAC/C,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,CAAC,KAAK,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;MACjD,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;;MAGnD,IAAIIF,aAAI,CAAC,aAAa,CAAC,GAAG,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;UACvC,OAAO,GAAG,CAAC;OACZ;MAEDU,UAAQ,CAAC,GAAG,EAAE,KAAK,CAAC,CAAC;MACrB,OAAO,GAAG,CAAC;EACb,CAAC;EAEM,MAAM,aAAa,GAAiB;MACzC,UAAU,EAAE,SAAS;MACrB,WAAW,EAAE,MAAM;MACnB,SAAS,EAAEJ,OAAK;MACHB,UAAU,EAAE,OAA2B;GACxC;;EChDD;;;;;;;EAmBO,MAAM,SAAS,GAAiB,uBAAuB,CAACqF,YAAG,CAAC;;ECnBnE;;;;;;;EAqBA,IAAIjF,UACI,CAAC;EAET,SAASJ,OAAK,CAAC,OAAoB;MACjCI,UAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAACKf,gBAAO,EAAE,IAAI,aAAa;UACtD,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;OACT,CAAC,CAAC;EACL,CAAC;EAED,SAAS,OAAO,CACZ,IAAwE;MAEIE,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,EAAC,MAAM,EAAC,EAAE,KAAK,EAAE,EAAC,GAAG,EAAC,EAAC,GAAG,IAAI,CAAC;MACvD,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,MAAM,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MACpD,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,MAAM,CAAC,KAAK,EAAE,MAAM,CAAC,KAAK,CAAC,CAAC;MAC3D,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,MAAM,QAAQ,GAAG,MAAM,CAAC,KAAK,CAAC,GAAG,CAAC,CAAC;MACnC,MAAM,KAAK,GAAG5F,aAAI,CAAC,aAAa,CAAC,MAAM,CAAC,KAAK,CAAC,GAAG,QAAQ,CAAC;;MAG1D,IAAIA,aAAI,CAAC,aAAa,CAAC,GAAG,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;UACvC,OAAO,GAAG,CAAC;OACZ;MAEDU,UAAQ,CAAC,GAAG,EAAE,KAAK,EAAE,QAAQ,EAAE,KAAK,CAAC,CAAC;MACtC,OAAO,GAAG,CAAC;EACb,CAAC;EAEM,MAAM,aAAa,GAAiB;MACzC,UAAU,EAAEkF,gBAAO;MACnB,WAAW,EAAE,MAAM;MACnB,SAAS,EAAEtF,OAAK;MACHB,UAAU,EAAE,OAA2B;GACxC;;EC1DD;;;;;;;EAyBA,SAAS,cAAc,CAAC,IAIvB;MACC,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;MACtC,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;MACnB,MAAM,EAAC,UAAU,EAAE,QAAQ,EAAC,GAAG,KAAK,CAAC;MAErC,MAAM,IAAI,GAAGN,aAAI,CAAC,aAAa,CAAC,UAAU,CAAC,CAAC;MAE5C,MAAM,gBAAgB,GAA4B,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC;MAC3D,gBAAgB,CAAC,IAAI,CAAC,GAAI,QAAoC,CAAC,CAAC;MAEhE,KAAK,IAAI,CAAC,GAAG,CAAC,GAAG,UAAU,CAAC,MAAM,EAAE,CAAC,GAAG,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,EAAE,CAAC,EAAE;UAC3D,gBAAgB,CAAC,IAAI,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC;OAC/B;MAED,MAAM,OAAO,GAAG,WAAW,CAAC,UAAU,CAAC;UACrC,MAAM,EAAE,EAAC,CAAC,EAAC;UACX,OAAO;UACP,KAAK,EAAE,EAAC,QAAQ,EAAE,gBAAgB,EAAE,aAAa,EAAE,CAAC,EAAC;OACtD,CAAe,CAAC;MAEjB,MAAM,mBAAmB,GACrBe,qBAAY,CAAC,WAAW,CAAC,OAAO,CAAC,KAAK,EAAE,UAAU,EAAE,IAAI,EAAE,KAAK,CAAC,CAAC;MAErE,MAAM,iCAAiC,GAAGA,qBAAY,CAAC,WAAW,CAC9D,mBAAmB,CAAC,MAAM,EAAE,UAAU,CAAC,MAAM,EAAE,KAAK,CAAC,CAAC;MAEID,MAAM,YAAY,GACdA,qBAAY,CAAC,mBAAmB,CAAC,OAAO,CAAC,KAAK,EAAE,UAAU,EAAE,IAAI,EAAE,KAAK,CAAC,CAAC;MAE7E,MAAM,aAAa,GAaKB,EAAC,CAAC,EAAE,OAAO,EAAC,CAAC;MACID,MAAM,YAAY,GAAiB,EAAC,KAAK,EAAE,mBAAmB,EAAC,CAAC;MACHe,MAAM,eAAe,GACjB,OAAO,CAAC,EAAC,MAAM,EAAE,aAAa,EAAE,OAAO,EAAE,KAAK,EAAE,YAAY,E

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AG,IAAI,CAAC;MACtC,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;MACnB,MAAM,GAAG,GAAG,  
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No license file was found, but licenses were detected in source scan.

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=====\n
*/\n\nimport { backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n 'number', // input_id\n
```

```
'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n]);\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs});\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'sum', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n }\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sum.js.map
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No license file was found, but licenses were detected in source scan.

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=====\n *\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n"}]
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/types.js.map
```

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Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/starter/parcel/index.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/starter/webpack/src/index.js
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No license file was found, but licenses were detected in source scan.

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```

```
=====\n*\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\ncreateBinaryKernelConfig(RealDiv, supportsFullBroadcast);
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RealDiv.js.map
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```

```
=====\n*\n\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GreaterEqual.js.map

No license file was found, but licenses were detected in source scan.

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=====\\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n
'number',\n 'number'\n]);\n\n function prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs:
ProdAttrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}
```

```

= inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const
{transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }
reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize
= util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of
the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as { } as KernelFunc\n};\n"}

```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Prod.js.map

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```

```

=====\n
*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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```
=====\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n }\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as { } as KernelFunc,\n};\n}}\n\n
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Identity.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\nexport function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?: DataType): KernelConfig {\n let wasmFunc: (\n aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // a_id, 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id, 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n function kernelFunc(args: { backend: BackendWasm, inputs: BinaryInputs }):\n TensorInfo {\n const { backend, inputs } = args;\n const { a, b } = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return out;\n }\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n }\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n return {\n kernelName, backendName: 'wasm', setupFunc, kernelFunc;\n }\n}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/binary\_kernel.js.map

No license file was found, but licenses were detected in source scan.

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 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a  
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 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for  
 the specific language governing permissions and\n \* limitations under the License.\n \*

```

=====
*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number,
inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop:
number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight:
number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number,
outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n 'number', //
xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', //
filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n
'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n\nfunction
depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs:
DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n
 const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n
 const
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations == null ? [1, 1] : dilations;\n
 const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape,
strides,\n ($dilations as number | [number, number]), pad, dimRoundingMode,\n true /* depthwise */);\n\n
 const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop =
convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n
 const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative
does not support dataFormat:` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
 wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n
 kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n"}

```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthwiseConv2dNative.js.map

No license file was found, but licenses were detected in source scan.

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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);"}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Round.js.map

No license file was found, but licenses were detected in source scan.

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","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);"}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu.js.map

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```
=====\n*/\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n { permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any,\n null /*void*/, [number, number, number]);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs,\n attrs: AnyAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { axis, keepDims } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const { transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis,\n backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: any as { } as KernelFunc\n};\n"]\n
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Any.js.map

No license file was found, but licenses were detected in source scan.

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```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/kernel\_utils.js.map

No license file was found, but licenses were detected in source scan.

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AQ,EAAG,UAAU;IACrB;QACE,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,Q
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AChB,UAAU,EAAE,UAA8B;CAC3C,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'../backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n (boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n
 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'number', // softNmsSigma\n]);\n\n function kernelFunc(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n }): TensorInfo[]
{\n const { backend, inputs, attrs } = args;\n const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma
} = attrs;\n const { boxes, scores } = inputs;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n const resOffset = wasmFunc(\n boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n const { pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs } =\n parseResultStruct(backend, resOffset);\n // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n const
selectedIndicesTensor =\n backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n const
selectedScoresTensor =\n backend.makeOutput([selectedSize, 'float32', pSelectedScores);\n return
[selectedIndicesTensor, selectedScoresTensor];\n }\n\n export const nonMaxSuppressionV5Config: KernelConfig =
{\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc
as { } as KernelFunc,\n };n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV5.js.map

No license file was found, but licenses were detected in source scan.

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AC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n
*\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu6.js.map

No license file was found, but licenses were detected in source scan.

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nt":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\\n
*\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LessEqual.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, Prelu, PreluInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { cast } from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' // out_id\n]);\n\n function prelu(args: { inputs: PreluInputs, backend: BackendWasm }) {\n const { inputs, backend } = args;\n const { x, alpha } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput = cast({ backend, inputs: { x }, attrs: { dtype: 'float32' });\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n }\n\n export const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as KernelFunc\n };\n}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prelu.js.map

No license file was found, but licenses were detected in source scan.

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```
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FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight:
number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
```

```

preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n\nfunction
fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:
FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias,
preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {}
as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation}
activation not yet supported for FusedDepthwiseConv2D` +\n `in the wasm backend.`);\n }\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n const
outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n
if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n
biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n"}

```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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```
=====\n*\n\nimport { KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n]);\n\n function mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n }) {\n const { inputs: { x }, backend, attrs: { paddings, mode } } = args;\n const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes = new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes = new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, MirrorPaddingMode[mode], outId);\n return out;\n }\n\n export const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as { } as KernelFunc,\n setupFunc: setup\n };
}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MirrorPad.js.map

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AC,EAAE;QACV,OAAO,KAAK,CAAC;KACd;AACH,CAAC,CAAC,CAAC","sourcesContent":["/**\n *
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=====
\n
*\n\nimport {env} from 'tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n]));\n\n/**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n]));\n } catch (e) {\n return false;\n }\n});\n\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/flags_wasm.js.map
```

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```
/**
```

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*/
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```

***** */
/**
* @deprecated Use `setWasmPaths` instead.
* Sets the path to the `wasm` file which will be fetched when the wasm
* backend is initialized. See
* https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
* for more details.
* @param path wasm file path or url
* @param usePlatformFetch optional boolean to use platform fetch to download
* the wasm file, default to false.
*
* @doc {heading: 'Environment', namespace: 'wasm'}
*/

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.node.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/miniprogram/index.js

```

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```
{"version":3,"file":"FloorDiv.js","sourceRoot":"","sources":["../../src/kernels/FloorDiv.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,QAAQ,EAAe,MAAM,uBAAuB,CAAC;AAE7D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AAEzD,MAAM,qBAAqB,GAAG,KAAK,CAAC;AACpC,MAAM,CAAC,MAAM,cAAc,GACvB,wBAAwB,CAAC,QAAQ,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n *\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n"]}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FloorDiv.js.map

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```
{"version":3,"file":"Sub.js","sourceRoot":"","sources":["../../src/kernels/Sub.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AACxD,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,IAAI,CAAC;AACnC,MAAM,CAAC,MAAM,SAAAS,GACIB,wBAAwB,CAAC,GAAG,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n *\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n"]}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sub.js.map

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*/
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/kernel_utils.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/kernel_utils.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/src/kernels/kernel_utils.ts
```

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```
{"version":3,"file":"Sin.js","sourceRoot":"","sources":["../../src/kernels/Sin.ts"],"names":[],"mappings":"AAAA;,,,,,;
,,,,,;GAeG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,SAAS,GAAiB,uBAAuB,CAAC,GAAG,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sin.js.map

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```
{"version":3,"file":"Square.js","sourceRoot":"","sources":["../../src/kernels/Square.ts"],"names":[],"mappings":"AA
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AAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Square.js.map

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```
{"version":3,"file":"Minimum.js","sourceRoot":"","sources":["../../src/kernels/Minimum.ts"],"names":[],"mappings"
:"AAAA;,,,,,;GAeG;AACH,OAAO,EAAe,OAAO,EAAC,MAAM,uBAAuB,CAAC;AAE5D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,KAAK,CAAC;AACpC,MAAM,CAA
C,MAAM,aAAa,GACTb,wBAAwB,CAAC,OAAO,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

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```
=====\n\n*\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n"]}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Minimum.js.map

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```
{"version":3,"file":"Tan.js","sourceRoot":"","sources":["../src/kernels/Tan.ts"],"names":[],"mappings":"AAAA;:::;;GAG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,SAAS,GAAiB,uBAAuB,CAAC,GAAG,CAAC,CAAC","sourcesContent":["/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n\n*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n"]}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tan.js.map

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```
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AAS,EAAE,KAAC;CACjB,CAAC", "sourcesContent": ["/\*\*\n \* @license\n \* Copyright 2019 Google LLC. All  
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=====

```
\n\n*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {fill} from './Fill';\nimport {CppType} from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n]);\n\n function pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes = new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes = new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(xId, xShapeBytes, x.shape.length, CCppType[x.dtype], prePaddingsBytes, postPaddingsBytes, constantValue, outId);\n\n return out;\n }\n\n export const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as KernelFunc,\n setupFunc: setup\n };
}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/PadV2.js.map
```

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```
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```

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 \* =====  
 \*/

Found in path(s):

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No license file was found, but licenses were detected in source scan.

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```

```
=====\n*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs: BatchToSpaceNDAttrs\n}) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { blockSize, crops } = attrs;\n\n const prod = blockSize.reduce((a, b) => a * b);\n const reshaped = backend_util.getReshaped(x.shape, blockSize, prod);\n const permuted = backend_util.getPermuted(reshaped.length, blockSize.length);\n const reshapedPermuted =\n backend_util.getReshapedPermuted(x.shape, blockSize, prod);\n const sliceBeginCoords =\n backend_util.getSliceBeginCoords(crops, blockSize.length);\n const sliceSize =\n
```

```
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:\n {x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n transpose({inputs: {x: xReshaped}, backend,\n attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n {inputs: {x: xTransposed}, backend,\n attrs: {shape: reshapedPermuted}});\n const result = slice({\n inputs: {x: xTransposedReshaped},\n backend,\n attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return\n result;\n\n\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n\n}}
```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/BatchToSpaceND.js.map
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agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nexport function\ncreateUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:\n number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const\n out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, CppDType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',\n setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n'/unary_kernel';\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-\ncore';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nexport\nfunction createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?:\n DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /*\n void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n TensorInfo {\n const {backend,\n inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId =\n backend.dataIdMap.get(b.dataId).id;\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape =\n backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape,\n outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return\n out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes =\n new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if
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(supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n } \n\n const
aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims =
backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) =>
v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA &&
loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting
along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n } \n\n return
{kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\ncreateBinaryKernelConfig(Add, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmFunc:\n (inputIds:
Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:
BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n
'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs:
TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =
backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if
(util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>
backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n
const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,
CppType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:
AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as { } as KernelFunc.\n};\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function
identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =
args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n
const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n }\n\nexport const
```



identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as KernelFunc,\n};\n"/\*\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {identity} from './Identity';\nimport {CppType} from './types';\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n\n export function transpose(\n args: {\n inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs\n }): TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp = false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n perm.length);\n return out;\n }\n\n function computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n outShape[i] = inShape[perm[i]];\n }\n return outShape;\n }\n\n function removeOneSizeDims(\n shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n if (shape[i] !== 1) {\n newShape.push(shape[i]);\n }\n if (shape[perm[i]] !== 1) {\n newPerm.push(perm[i]);\n }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n let minValIdx = -1;\n for (let j = 0; j < newPerm.length; ++j) {\n if (newPerm[j] >= i && (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n minValIdx = j;\n }\n }\n newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n }\n\n export const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n };\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {transpose} from './Transpose';\n/**\n * Compute permutation axes and do a transpose if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n x: TensorInfo,
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axis: number|number[], backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean}\n {\n const xShape = x.shape;\n const xRank = x.shape.length;\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n const newShape: number[] = new Array(xRank);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = xShape[permutedAxes[i]];\n }\n axes = backend_util.getInnerMostAxes(axes.length, xRank);\n xTransposed =\n transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n const xId = backend.dataIdMap.get(x.dataId).id;\n const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n if (transposedId !== xId) {\n inputWasTransposed = true;\n }\n }\n return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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*\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null\n /*void*/, [number, number, number]);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs:\n AllAttrs}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}\n = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const\n {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input =\n transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: all as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */

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*\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any,\n null /*void*/, [number, number, number]);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,

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attrs: AnyAttrs});\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis,\n backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n out;\n }\n\n export const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: any as {} as KernelFunc\n };n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n\n *\\\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-\ncore';\nimport {BackendWasm} from './backend_wasm';\nimport {permuteAxesAndTranspose} from\n './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize:\n number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n]);\n\n function argmax(\n args:\n {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId =\n backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes,\n inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose\n was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =\n transposedId;\n }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out =\n backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize =\n util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId,\n CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n // dispose of the\n transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n }\n\n export const\n argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as {}

as KernelFunc,\n setupFunc: setup\n };n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n\n *\\\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from

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'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n xId:\n number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:\n number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n]);\n}\n\nfunction\navgPool(\n args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs,\n backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =\n convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const\n padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =\n convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend does not support dataFormat: ` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n `was backend\n only supports average pooling with dilation = [1, 1], ` +\n `got [${convInfo.dilationHeight},\n ${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const\n outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n xId, x.shape[0], x.shape[1], x.shape[2],\n filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-\n core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n args: {inputs:\n ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} =\n inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape =\n util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () =>\n `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n `shape must have the same number of\n elements.`);\n\n // Backend needs to track refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from

```

```

'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number' // out_id\n]);\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend:
BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const
bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const
innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ?
a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -
1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA =
util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const
batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input
batch dimensions must either be the ` +\n `same or at least one input batch dimension must be 1. Got input `
+\n `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape =
outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and ` +\n `${innerShapeB}) of Tensors with shapes
${a.shape} and ` +\n `${b.shape} and transposeA=${transposeA}` +\n ` and transposeB=${transposeB}
must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB,
innerShapeB] :\n [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the
implementation is designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs:
{shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId
= backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim
= transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const
batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim,
rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new
Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new
Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n a3dId, aShapeBytes, a3d.shape.length, b3dId,
bShapeBytes,\n b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape = outShape;\n return out;\n}\n\nexport const batchMatMulConfig:
KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
batchMatMul as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====*\n\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype,
simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if
(simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset =

```













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```
=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}\nfrom '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from\n '../kernel_utils/shared';\n\nexport function slice(\n args: {inputs: SliceInputs, attrs: SliceAttrs, backend:\nBackendWasm}) {\n const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n const [begin_, size_] =\nslice_util.parseSliceParams(x, begin, size);\n\n const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,\nsize_);\n const xVals = backend.readSync(x.dataId);\n const out = backend.makeOutput(size_, x.dtype);\n const\nxStrides = util.computeStrides(x.shape);\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinuous)\n {\n const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n if (x.dtype === 'string') {\n outData.stringBytes =\n (xVals as Uint8Array[])\n .slice(flatOffset, flatOffset +\nutil.sizeFromShape(size_));\n } else {\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(\n (xVals as TypedArray)\n .subarray(flatOffset, flatOffset +\nutil.sizeFromShape(size_));\n);\n }\n\n return out;\n }\n\n if (x.dtype === 'string') {\n const res =\nsliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n outData.stringBytes = res as Uint8Array[];\n return\nout;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2)\n {\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as\n[number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],\noutVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)\n {\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number,\nnumber, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\nsliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return\nout;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:\nbackend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI;\ni++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),\noutOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:\nnumber, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:\n[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <\nendI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:\nnumber, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,\nnumber, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK\n+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)\n {\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +\nbeginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as { } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2021 Google LLC. All Rights\nReserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\nexcept in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\nsoftware\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\nOR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs: BatchToSpaceNDAttrs\n}) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { blockSize, crops } = attrs;\n\n const prod = blockSize.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockSize, prod);\n const permuted = backend_util.getPermuted(reshaped.length, blockSize.length);\n const reshapedPermuted = backend_util.getReshapedPermuted(x.shape, blockSize, prod);\n const sliceBeginCoords = backend_util.getSliceBeginCoords(crops, blockSize.length);\n const sliceSize = backend_util.getSliceSize(reshapedPermuted, crops, blockSize.length);\n\n const xReshaped = reshape({ inputs: { x }, backend, attrs: { shape: reshaped } });\n const xTransposed = transpose({ inputs: { x: xReshaped }, backend, attrs: { perm: permuted } });\n const xTransposedReshaped = reshape({ inputs: { x: xTransposed }, backend, attrs: { shape: reshapedPermuted } });\n const result = slice({ inputs: { x: xTransposedReshaped }, backend, attrs: { begin: sliceBeginCoords, size: sliceSize } });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport { Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nexport function cast(\n args: {\n inputs: CastInputs,\n attrs: CastAttrs,\n backend: BackendWasm\n }):\n TensorInfo {\n const { inputs: { x }, attrs: { dtype }, backend } = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport { KernelConfig, Ceil } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
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the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n\n*\n\nimport { ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip =\n backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', //\n max\n 'number' // out_id\n]);\n\n function clip(args: {\n inputs: ClipByValueInputs,\n backend:\n BackendWasm,\n attrs: ClipByValueAttrs\n }) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =\n backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId,\n clipValueMin, clipValueMax, outId);\n return out;\n }\n\n export const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as\n KernelFunc\n }; \n /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n}
```

```
=====\n\n*\n\nimport { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { concatImplCPU } from\n '../kernel_utils/shared';\n\nimport { identity } from './Identity';\n\nimport { reshape } from './Reshape';\n\nexport function\n concat(\n args: {\n inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs\n }) {\n const {inputs, backend}\n = args;\n\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n let outShape =\n backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n // Keep only non-empty tensors (ignore tensors\n with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n\n if ($inputs.length ===\n 1) {\n return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const out = backend.makeOutput(outShape,\n inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n return out;\n }\n\n const shapes =\n $inputs.map(t => t.shape);\n\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype ===\n 'string') {\n // Any concat of n-dimensional tensors across any axis can be reduced to\n // a concatenation of two-\n dimensional tensors across the axis 1 by first\n // partitioning the axes of the original tensors\n // into a two-dimensional tensor by\n // collapsing these two sets of axes and\n // concatenate the resulting matrices across the axis 1, finally reshaping\n // the result to have the proper shape.\n const inputs2D = $inputs.map(t => {\n const innerSize =\n util.sizeFromShape(t.shape.slice(axis));\n const shape = [-1, innerSize];\n return reshape({inputs: {x: t},\n backend, attrs: {shape}});\n });\n\n const inputsValShapes = inputs2D.map(t => {\n return {vals:\n backend.readSync(t.dataId), shape: t.shape};\n });\n\n // Concat 2d tensors along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n\n const simplyConcat =\n inputs2D[0].shape[0] === 1;\n\n const outVals = concatImplCPU(\n inputsValShapes, outShape,\n inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n\n const\n outData = backend.dataIdMap.get(out.dataId);\n\n outData.stringBytes =\n backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n }\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n\n let sumInnerDims =\n 0;\n\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n sumInnerDims += innerDim;\n return innerDim;\n });\n\n const inVals = $inputs.map(input =>\n backend.typedArrayFromHeap(input));\n\n const outVals = backend.typedArrayFromHeap(out);\n\n for (let b = 0; b <
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batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const
innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n}\n return
out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as { } as KernelFunc;\n};\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====*\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number,
filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad:
number,\n dilationHeight: number, dilationWidth: number, strideHeight: number, strideWidth: number,
inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n 'number', // xId\n
'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n
'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n
'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n
'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n
'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend:
BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n
const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false,
$dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const
padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom =
convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type
=== 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend
Conv2D does not support dataFormat: "` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc;\n};\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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=====\n
*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n xRowStride: number, xColStride: number, xChannelStride: number,\n yBatchStride: number, yRowStride:
number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n]);\n\nfunction conv2DBackpropInput(args: {\n backend:
BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const { backend, inputs, attrs } = args;\n const { dy, filter } = inputs;\n const { strides, pad, dataFormat,
dimRoundingMode, inputShape } = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n
inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n
inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2,
xBatchStride, xRowStride,\n xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n
yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n
kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
conv2DBackpropInput as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", "/*\n * @license\n
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'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,
TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { cast }
from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest
= 1\n}\n\nlet wasmCropAndResize: (\n imagesId: number, boxesId: number, boxIndId: number, numBoxes:
number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number,
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
 wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n
 'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n
 'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n
 'number', // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n
 attrs: CropAndResizeAttrs\n}): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { method,
 extrapolationValue, cropSize } = attrs;\n const { image, boxes, boxInd } = inputs;\n const numBoxes =
 boxes.shape[0];\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =
 [numBoxes, cropHeight, cropWidth, image.shape[3]];\n let imagesData =
 backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData =
 cast({ backend, inputs: { x: image }, attrs: { dtype: 'float32' }});\n imagesData =
 backend.dataIdMap.get(castedData.dataId);\n }\n const imagesId = imagesData.id;\n const boxesId =
 backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n const
 out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
 imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n wasmCropAndResize(\n
 imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n InterpolationMethod[method as {}] as keyof typeof InterpolationMethod,\n extrapolationValue, outId);\n if
 (castedData !== null) {\n backend.disposeData(castedData.dataId);\n }\n return out;\n}\n\nexport const
 cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:
 setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}\nfrom '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from\n './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:\n number,\n finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:\n BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n 'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n 'number' //\n dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs:\n CumsumAttrs}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis,\n exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n util.assert(x.dtype === 'float32' || x.dtype ===\n 'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis\n to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n const permutedOut =\n backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =\n backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,\n finalDim,\n permutedOutId, CppDType[x.dtype]);\n // transpose data back if permuted\n let out =\n permutedOut;\n if (permutation !== null) {\n const undoPermutation =\n backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs:\n {perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n }\n backend.disposeData(permutedOut.dataId);\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =\n {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as\n KernelFunc\n };\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n */
```

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=====\n\n*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,\n util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:\n (\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number,\n outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null\n /*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n 'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n 'number', // outId\n]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs:\n DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n const batchSize = x.shape[0];\n const inputHeight =\n (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth =\n (dataFormat === 'NHWC') ?\n x.shape[2] : x.shape[3];\n const inputDepth =\n (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n const\n outputHeight = inputHeight * blockSize;\n const\n outputWidth = inputWidth * blockSize;\n const\n outputDepth =\n inputDepth / (blockSize * blockSize);\n const\n outputShape =\n (dataFormat === 'NHWC') ?\n [batchSize,\n outputHeight,\n outputWidth,\n outputDepth]\n :\n [batchSize,\n outputDepth,\n outputHeight,\n outputWidth];\n const
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out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const
xId = xData.id;\n const xStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n const outStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n\n wasmDepthToSpace(\n xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n\n"/**\n * @license\n *
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License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number,
inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop:
number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight:
number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number,
outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n 'number', //
xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', //
filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n
'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n\nfunction
depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs:
DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const
xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n const
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations === null ? [1, 1] : dilations;\n\n
const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape,
strides,\n ($dilations as number | [number, number]), pad, dimRoundingMode,\n true /* depthwise */);\n\n
const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop =
convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative
does not support dataFormat: ` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n

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kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n", "/\*\n \* @license\n \* Copyright 2021 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* \n \* http://www.apache.org/licenses/LICENSE-2.0\n \* \n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n inputRank\n }]);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
```

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```
=====
*import {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';import {Fill, FillAttrs} from
'@tensorflow/tfjs-core';import {BackendWasm} from './backend_wasm';export function fill(args: {attrs:
FillAttrs, backend: BackendWasm}) {const {attrs: {shape, value, dtype}, backend} = args;const out =
backend.makeOutput(shape, dtype);const outVals = backend.typedArrayFromHeap(out);outVals.fill(value as
number);return out;}export const fillConfig: KernelConfig = {kernelName: Fill, backendName:
'wasm', kernelFunc: fill as {} as KernelFunc,};"/** @license Copyright 2019 Google LLC. All
Rights Reserved. Licensed under the Apache License, Version 2.0 (the "License"); you may not use this
file except in compliance with the License. You may obtain a copy of the License at
```

<http://www.apache.org/licenses/LICENSE-2.0> Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====
*import {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';import {BackendWasm} from './backend_wasm';let wasmFlipLeftRight: (xId: number, batch:
number, imageHeight: number, imageWidth: number, numChannels: number, outId: number) =>
void;function setup(backend: BackendWasm) {wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [number, // xId number, // batch number, // imageHeight number, //
imageWidth number, // numChannels number, // outId]);}export function flipLeftRight(
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {const {inputs, backend} = args;
const {image} = inputs;const out = backend.makeOutput(image.shape, image.dtype);const imageId =
backend.dataIdMap.get(image.dataId).id;const outId = backend.dataIdMap.get(out.dataId).id;const [batch,
imageHeight, imageWidth, numChannels] = image.shape;wasmFlipLeftRight(imageId, batch,
imageHeight, imageWidth, numChannels, outId);return out;}export const flipLeftRightConfig:
KernelConfig = {kernelName: FlipLeftRight, backendName: 'wasm', kernelFunc: flipLeftRight as {} as
KernelFunc, setupFunc: setup};"/** @license Copyright 2020 Google LLC. All Rights Reserved.
Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in
compliance with the License. You may obtain a copy of the License at
```

<http://www.apache.org/licenses/LICENSE-2.0> Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====
*import {Floor, KernelConfig} from '@tensorflow/tfjs-core';import {createUnaryKernelConfig} from
'./unary_kernel';export const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);"/** @
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2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a
copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable
law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for
the specific language governing permissions and limitations under the License.
```

```
=====
*import {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';import {createBinaryKernelConfig} from
```

```
./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend: BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { varianceEpsilon } = attrs;\n const { x, mean, variance, offset, scale } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmBatchNorm(xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {\n KernelFunc\n }; \n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { FusibleActivation } from './types';\n\nlet wasmFusedConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction
```

```

fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n})
{\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n
strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } =
attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n FusableActivation[activation as {}] as keyof typeof FusableActivation;\n if (fusedActivation == null) {\n throw
new Error(\n `${activation} activation not yet supported for FusedConv2D` +\n `in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n `FusedConv2D only supports rank-1 bias but got` +\n `rank
${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not` +\n `match the number of output channels
(${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const
filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight =
convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const
strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support
dataFormat:` +\n `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
fusedConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight:
number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //

```

```

filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n
'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n];\n}\n\nfunction
fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:
FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias,
preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n const fusedActivation =\n FusableActivation[activation as {\n
as key of typeof FusableActivation\n}];\n if (fusedActivation == null) {\n throw new Error(\n `{$activation}
activation not yet supported for FusedDepthwiseConv2D` +\n `in the wasm backend.`);\n }\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n const
outputChannels = convInfo.outChannels;\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got` +\n `rank {$biasData.shape.length}.`);\n }\n
if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not` +\n `match the number of output channels (${outputChannels})`);\n }\n
biasId = biasData.id;\n }\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n ` ${dataFormat}'. Please use 'NHWC'.`);\n }\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {\n } as KernelFunc\n};\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet
wasmGatherNd: (\n xId: number, dtype: CCppType, indicesId: number, numSlices: number,\n sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n

```





```

shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n", "/**\n
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig }
from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
* http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from
'/types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
out_id\n]);\n}\n\nexport function leakyRelu(\n args: {\n inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm\n}): TensorInfo {\n const { inputs: { x }, attrs: { alpha }, backend } = args;\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either
float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape)
!== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha,
outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n
backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as { } as KernelFunc,\n};\n", "/**\n * @license\n *
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the specific language governing permissions and\n * limitations under the License.\n *
=====
\n

```



```

inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId =
transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
 wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the
transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: max as { } as KernelFunc\n};\n\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const maximumConfig: KernelConfig =\n
createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', //
inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', //
padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //
inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n\nfunction maxPool(\n args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =

```

```

convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n
backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs};\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n
cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId,
reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed
tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype
!== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport\n { permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\n\nlet wasmMin: (xId:\n number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n\n function min(args: { backend:\n BackendWasm, inputs: MinInputs, attrs: MinAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { axis, keepDims } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let\n inputId = xId;\n let input = x;\n\n const { transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId =\n backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We\n will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes,\n inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape,\n axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape,\n input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape,\n originalAxes);\n out.shape = newShape;\n }\n\n return out;\n }\n\n export const minConfig: KernelConfig = {\n kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as\n KernelFunc\n };\n }\n\n /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n}
```

```
=====\n*\n\nimport { KernelConfig, Minimum } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n\n/**\n * @license\n * Copyright 2021 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs } from '@tensorflow/tfjs-\n core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from './types';\n\n// Must match\n enum in MirrorPad.cc\n enum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n }\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes:\n Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction
```

```

setup(backend: BackendWasm) {
 wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [
 'number', // xId
 'array', // x.shape
 'number', // x.shape.length
 'number', // x.dtype
 'array', // pre-paddings
 'array', // post-paddings
 'number', // mode
 'number', // outId
]);

 function mirrorPad(args: {
 inputs: MirrorPadInputs,
 backend: BackendWasm,
 attrs: MirrorPadAttrs
 }) {
 const {inputs: {x}, backend, attrs: {paddings, mode}} = args;

 const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);
 const xId = backend.dataIdMap.get(x.dataId).id;
 const out = backend.makeOutput(outShape, x.dtype);
 const outId = backend.dataIdMap.get(out.dataId).id;
 const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);
 const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);
 const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);
 const prePaddingsBytes = new Uint8Array(new Int32Array(prePaddingsFlat).buffer);
 const postPaddingsBytes = new Uint8Array(new Int32Array(postPaddingsFlat).buffer);

 wasmMirrorPad(xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes, postPaddingsBytes, MirrorPaddingMode[mode], outId);
 return out;
 }

 export const mirrorPadConfig: KernelConfig = {
 kernelName: MirrorPad,
 backendName: 'wasm',
 kernelFunc: mirrorPad as { } as KernelFunc,
 setupFunc: setup
 };
}

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 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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 * limitations under the License.
 */

```

```

=====
import {KernelConfig, Multiply} from '@tensorflow/tfjs-core';
import {createBinaryKernelConfig} from './binary_kernel';

const supportsFullBroadcast = true;
export const multiplyConfig: KernelConfig = createBinaryKernelConfig(Multiply, supportsFullBroadcast);

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 */

```

```

=====
import {KernelConfig, Neg} from '@tensorflow/tfjs-core';
import {createUnaryKernelConfig} from './unary_kernel';

export const negConfig: KernelConfig = createUnaryKernelConfig(Neg);

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 */

```

```

=====
import {BackendWasm} from '../backend_wasm';

// Analogous to `struct Result` in `non_max_suppression_impl.h`
interface Result {
 pSelectedIndices: number;
 selectedSize: number;
 pSelectedScores: number;
 pValidOutputs: number;
}

/**
 * Parse the result of the c++ method, which has the shape equivalent to
 * `Result`.
 */
export function parseResultStruct(backend: BackendWasm, resOffset: number): Result {
 const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);
 const pSelectedIndices = result[0];
 const selectedSize = result[1];
 const pSelectedScores = result[2];
 const pValidOutputs = result[3];
 // Since the result was allocated on the heap, we have to delete it.
}

```

```
backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores,\n pValidOutputs};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,\n NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from\n './backend_wasm';\nimport {parseResultStruct} from './NonMaxSuppression_util';\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)\n => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n]);\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs:\n NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold,\n maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =\n backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const\n resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const\n {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor\n =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return\n selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:\n NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as { }\n as\n KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,\n NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from\n './backend_wasm';\nimport {parseResultStruct} from './NonMaxSuppression_util';\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =\n backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //\n scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold,\n padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =\n backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const\n resOffset =\n wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
```

```

padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the
heap.\n\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor,
validOutputsTensor];\n\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *
=====
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n
'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'number', // softNmsSigma\n]);\n\n\nfunction kernelFunc(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[]
{\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma}
= attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n\n backend.wasm._free(pValidOutputs);\n\n const
selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const
selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return
[selectedIndicesTensor, selectedScoresTensor];\n\n\nexport const nonMaxSuppressionV5Config: KernelConfig =
{\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc
as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*/\n\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const notEqualConfig: KernelConfig =\n
createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
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```
=====\n*\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue: number, offValue: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n\n function oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n }\n\n export const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as KernelFunc,\n }; \n /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n}
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.tensorArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as KernelFunc,\n}; \n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
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=====\n*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n shape, t.shape, \n 'All tensors passed to stack must have matching shapes');\n util.assert(\n dtype === t.dtype, \n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const expandedT =\n expandDims({input: t}, backend, attrs: {dim: axis});\n intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n intermediateTensorInfos.forEach(t =>
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backend.disposeData(t.dataId));\n\n return result;\n\n}\n\nexport const packConfig: KernelConfig = {\n kernelName:\n Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright\n 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-\n core';\nimport {BackendWasm} from './backend_wasm';\nimport {fill} from './Fill';\nimport {CppType} from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:\n number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null\n /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n]);\n}\n\nfunction pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const\n {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n (p, i) =>\n p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-\ncircuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const\n xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const\n outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =\n new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple =>\n padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new\n Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new\n Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n xId, xShapeBytes, x.shape.length,\n CCppType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport\n const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as\n KernelFunc,\n setupFunc: setup\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\nimport
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{BackendWasm} from './backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' //
out_id\n]);\n\n function prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend}
= args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if
(input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype
!== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n }\n\n export const preluConfig:
KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as { } as
KernelFunc\n };
\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n\n function prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs:
ProdAttrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}
= inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const
{transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize
= util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of
the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n }\n\n export const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as { } as
KernelFunc\n };
\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const
range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} =
args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n const out = backend.makeOutput([values.length], dtype);\n const outVals =
backendtypedArrayFromHeap(out);\n outVals.set(values);\n return out;\n };\n\nexport const rangeConfig:
KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC.
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file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/*\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/*\n * @license\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from
'/Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear =

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backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', //
oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', //
newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n}\n\nfunction
resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}):
TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners,
halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth,
numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData =
backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n
cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData =
backend.dataIdMap.get(castedData.dataId);\n }\n\n const xId = xData.id;\n\n const out =
backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight,
oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if
(castedData !== null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {identity} from
'./Identity';\n\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n xId: number, axes: Uint8Array,
axesLength: number, outShape: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n
'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n
'number' // out_id\n]);\n}\n\nexport function reverse(\n args: {inputs: ReverseInputs, backend: BackendWasm, attrs:
ReverseAttrs});\n\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} =
attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n return
identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes =
new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n wasmReverse(\n xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
outId);\n\n const reshaped =\n reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n
backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n
kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc:
setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,

```

```

TensorInfo} from '@tensorflow/tfjs-core';\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport
{ BackendWasm } from './backend_wasm';\n\nlet wasmRotate: (\n xId: number, batch: number, imageHeight:
number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
 wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', //
batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', //
radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n
 'number', // outId\n]);\n\n export function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n
 backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n }): TensorInfo {\n const { inputs, backend, attrs } =
args;\n const { image } = inputs;\n const { radians, fillValue, center } = attrs;\n\n const out =
backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n
 const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues =
typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
 wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY,
fillBytes, fillValues.length, outId);\n return out;\n }\n\n export const rotateWithOffsetConfig: KernelConfig = {\n
 kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n
 setupFunc: setup\n };}\n\n /**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */\n\n =====\n\n *\nimport { KernelConfig, Round } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n\n /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */\n\n =====\n\n *\nimport { KernelConfig, Rsqrt } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n\n /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */\n\n =====\n\n *\nimport { KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util }
from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from
'./types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank:

```

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number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', //
sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n
'number' // outId\n]);\n}\n\nfunction scatterNd(\n args:\n {backend: BackendWasm, inputs:
ScatterNdInputs, attrs: ScatterNdAttrs});\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices,
updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if
(util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides,
outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData =
backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize,
stridesBytes, outputSize, outId);\n\n return out;\n }\n}\n\nexport const scatterNdConfig: KernelConfig = {\n
kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*/\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number, eId: number,
offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n
'number', // offset\n 'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1:\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {}
as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs});\n
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out

```

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= backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId,
outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as { } as KernelFunc\n};\n", "/**\n * @license\n
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agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'/unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", "/**\n * @license\n
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'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n
'number', // channels\n 'number' // batch\n]);\n}\n\nfunction softmax(\n args: { backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs }):\n TensorInfo {\n const { backend, inputs: { logits }, attrs: { dim } } =
args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape,
logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channels = logits.shape[dim];\n
const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if
(util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return
out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: softmax as { } as KernelFunc\n};\n", "/**\n * @license\n
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software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,
SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { padV2Config } from
'/PadV2';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\n\nfunction
spaceToBatchND(\n args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs:
SpaceToBatchNDAttrs\n}) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { blockShape,
paddings } = attrs;\n const prod = util.sizeFromShape(blockShape);\n const completePaddings: Array<number,
number> = [[0, 0]]; completePaddings.push(...(paddings as Array<number, number>));\n for (let i = 1 +
blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n\n const paddedX =

```



```

padV2Config.kernelFunc({\n inputs: {x},\n backend,\n attrs: {padding: completePaddings, constantValue:
0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape,
blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n
reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs:
ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n const
paddedXReshaped =\n reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs:
TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n TransposeAttrs = {perm:
permutedReshapedPaddedPermutation};\n const paddedXT =\n transpose({inputs: transposeInputs, backend,
attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const
resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n {inputs:
resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n
backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return
result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as { } as KernelFunc\n};\n"/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {\n const {inputs, attrs, backend} = args;\n const {x} = inputs;\n const
{numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n
const size = x.shape.slice();\n return splitSizes.map(s => {\n const xSliceSize = [...size];\n xSliceSize[$axis] =
s;\n const xSlice =\n slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n begin[$axis] += s;\n
return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName:
'wasm',\n kernelFunc: splitV as { } as KernelFunc\n};\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n"/**\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====

```

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\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n", "/\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n 'number', // alpha\n 'number', // dtype\n 'number', // out_id\n]);\n}\nfunction step(\n args: {\n backend: BackendWasm,\n inputs: StepInputs,\n attrs: StepAttrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId, alpha, CCppType[x.dtype], outId);\n return out;\n}\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', // outShapeLength\n 'number', // outId\n]);\n}\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n
```

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sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n
 x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n
let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x},
 backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is
 memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have
 rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n
 // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x},
 backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape:
 finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out =
 backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
 xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes
 = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new
 Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const
 outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes =
 new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =
 backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length,
 beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n
 result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n
 }\n\n return result;\n\n\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n
 backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as { } as KernelFunc\n};\n\n"/**\n *
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 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
 copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
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 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n *
 =====\n
 *\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
 Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
 file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
 law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
 =====\n
 *\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
 {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
 number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
 BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n 'number', // input_id\n
 'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n]);\n\nfunction sum(args: {backend:
 BackendWasm, inputs: SumInputs, attrs: SumAttrs}): TensorInfo {\n const {backend, inputs, attrs} = args;\n
 const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let
 inputId = xId;\n let input = x;\n const {transposed, axes, originalAxes, inputWasTransposed} =\n
 permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const
 transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was

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not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =
transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length,
input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'sum', reductionAxes,
input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of
the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/*\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmTile: (\n xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', //
x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n
]);\n}\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs,
backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} =
attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n }\n\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out =

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backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: tile as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number',
// x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n
'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n
const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n const outIndices =
backend.makeOutput(outputShape, 'int32');\n const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length,\n
CppType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n\n", "/*\n * @license\n * Copyright 2021 Google LLC. All
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file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmTransform: (\n imageId:
number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth:
number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n
stridesLength: number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform,
null /* void */, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n
'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n
'number', // imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n
'number', // interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number' // outId\n
]);\n}\n\nfunction transform(\n args:\n {backend: BackendWasm, inputs: TransformInputs, attrs:
TransformAttrs});\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n
const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n const [batch, imageHeight, imageWidth,

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numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape :
[imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as
[number, number, number, number];\n const strides =\n new Uint8Array(new
Int32Array(util.computeStrides(image.shape)).buffer);\n\n const out = backend.makeOutput(outShape,
image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData =
backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData =
backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const
interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case
'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n
fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n
break;\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n
outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId,
fillModeId, fillValue,\n outId);\n\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n
kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as { } as
KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { slice } from
'./Slice';\n\nfunction unpack(\n args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n TensorInfo[] {\n const { inputs, backend, attrs } = args;\n const { value } = inputs;\n let { axis } = attrs;\n if (axis <
0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank =
value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank;\n i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new
Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },
backend});\n }\n return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n}\n\nexport const
unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as { } as
KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from 'tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend:
BackendWasm }) {\n const { inputs: { x }, backend } = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const
zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike
as { } as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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=====\n \*\n //

We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {fusedMatMulConfig} from './kernels/\_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from

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./kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n
 argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n
 ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n
 cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n
 depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n
 flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n fusedBatchNormConfig,\n
 fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n
 greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n
 logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n
 minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n
 nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n
 onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n
 realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n
 rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n
 sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n
 squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n
 tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n
 zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n", "/*\n *
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=====\n
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n]));\n\n/**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,

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115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n]));\n } catch (e) {\n return false;\n }\n});\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"];var scriptDirectory=\.";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=
nodePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,\\^");arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
\\worker_threads\\ module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new

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Uint8Array(readbuffer(f))data=read(f,"binary\");assert(typeof data===\object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\function\"){quit_=function(status){quit(status)}if(typeof print!=\"undefined\"){if(typeof
console===\undefined\"){console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=\"undefined\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\blob:\")!=\"0\"){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\^")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\fs\");if(!nodePath)nodePath=require(\path\");filename=n
odePath[\normalize\](filename);return
nodeFS[\readFileSync\](filename,binary?null:\utf8\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)
}setWindowTitle=function(title){document.title=title}}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance===\undefined\){global.performance=require(\perf_hooks\").performance}}var
out=Module[\print\"]||console.log.bind(console);var err=Module[\printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\arguments\"])arguments_=Module[\arguments\"];if(Module[\thisProgram\"])thisProgram=
Module[\thisProgram\"];if(Module[\quit\"])quit_=Module[\quit\"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\wasmBinary\"])wasmBinary=Module[\wasmBinary\"];var
noExitRuntime=Module[\noExitRuntime\"]||true;if(typeof WebAssembly!=\"object\"){abort(\no native wasm
support detected\)}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[_\"+ident];assert(func,\Cannot call unknown function \"+ident+, make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\string\":function(str){var
ret=0;if(str!=\"null\"&&str!=\"undefined\"&&str!=\"0\"){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\string\")return UTF8ToString(ret);if(returnType===\boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!=\"0\")stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var

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numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new
Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new
Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new
Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new
Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new
Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module[\"wasmMemory\"]};buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=
Module[\"wasmMemory\"]}else{wasmMemory=new
WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad
memory\")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors
()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof

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Module["preRun"]===\function\");Module["preRun"]=[Module["preRun"];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]===\function\");Module["postRun"]=[Module["postRun"];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\`addRunDependency cannot be used in a
pthread
worker\`);runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or(\`Pthread aborting at \`${new
Error).stack\`;what+=\`;err(what);ABORT=true;EXITSTATUS=1;what=\`abort(\`${what}\`. Build with -s
ASSERTIONS=1 for more info.\`;var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix=\`data:application/octet-stream;base64,\`;function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\`file://\`;function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\`tfjs-backend-wasm-threaded-
simd.wasm\`;if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\`both async and sync fetching of the
wasm failed\`}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\`function\`&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\`same-
origin\`}).then(function(response){if(!response["ok"]){throw\`failed to load wasm binary file at
\`${wasmBinaryFile}\`"}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))}}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\`a\`:asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(--numWorkersToLoad)removeRunDependency(\`wasm-
instantiate\`)}))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\`wasm-instantiate\`)}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function

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instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err(\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\").then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(Promise.reject);return{}}var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func())}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EB
ADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOST
DOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
__emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"__emscripten_futex_wake\"]=__emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni

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ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}function
cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cancelThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cancelThread!";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({"cmd\":"cancel"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cleanupThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cleanupThread!";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)} }var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb);initWorker:function(){,t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()};if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\":"exit"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\":"cancelDone"})},terminateAllThreads:function(){for(var t in
PThread.threads){var
pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)} }PThre
ad.threads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker pthread=null },returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n(){delete
PThread.threads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker pthread);worker pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker pthread)PThread.currentProxiedOperationCallerThread=worker pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){var
thread=PThread.threads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"])}}else{con

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sole.error('Internal error! Worker sent a message \''+cmd+'\' to target pthread '+d[\'"targetThread"\']+\'', but that
thread no longer
exists!')})PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\'"processQueuedMainThread
Work\'){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\'"spawnThread\"){spawnThread(e.data)}else
if(cmd===\'"cleanupThread\"){cleanupThread(d[\'"thread"\'])}else
if(cmd===\'"killThread\"){killThread(d[\'"thread"\'])}else
if(cmd===\'"cancelThread\"){cancelThread(d[\'"thread"\'])}else
if(cmd===\'"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\'"print\"){out(\'"Thread \' +d[\'"threadId"\']+\'":
\' +d[\'"text"\'])}else if(cmd===\'"printErr\"){err(\'"Thread \' +d[\'"threadId"\']+\'": \' +d[\'"text"\'])}else
if(cmd===\'"alert\"){alert(\'"Thread \' +d[\'"threadId"\']+\'": \' +d[\'"text"\'])}else if(cmd===\'"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\'"exitProcess\"){try{exit(d[\'"returnCode"\'])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\'"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\'"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\'"setimmediate\"){worker.postMessage(e.data)}else{err(\'"worker sent an unknown command
\' +cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\'"pthread sent
an error! \' +e.filename+\'":\' +e.lineno+\'":
\' +e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\'"message\',function(data){worker.onmessage({data:d
ata})});worker.on(\'"error\',function(data){worker.onerror(data)});worker.on(\'"exit\',function(data){})}worker.post
Message({\'"cmd\":"load\',\'"urlOrBlob\":"Module[\'"mainScriptUrlOrBlob"\"]|_scriptDir,\'"wasmMemory\":"wasmMe
memory,\'"wasmModule\":"wasmModule"}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\'"tfjs-
backend-wasm-threaded-simd.worker.js\');PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length===0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\'"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\'"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module[\'"invokeEntryPoint\"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\'"Assertion failed: \' +UTF8ToString(condition)+'\', at:
\' +[filename?UTF8ToString(filename):\'"unknown filename"\',line,func?UTF8ToString(func):\'"unknown
function"\'])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\'"hrtime"\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\'"__performance_now_clock_drift"\"]}}else if(typeof
dateNow!=="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId===mainThreadId){postMessag
e({\'"cmd\":"processQueuedMainThreadWork\'})}}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\'"targetThread\":"targetThreadId,\'"cmd\":"processThreadQueu
e\'})}}else{var pthread=PThread.pthreads[targetThreadId];var

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worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({"cmd":"processThreadQueue"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value \"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr)}return 0}}function _emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function _emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);return ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function _emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callArgs.length=numCallArgs;var b=args>>3;for(var i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}var isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function _emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function emscripten_realloc_buffer(size){try{wasmmemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-1;i>=0;--

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i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListeners:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListeners);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,argsList)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList});JSEvents.deferredCalls.sort(function(x,y){return x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.deferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!JSEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,eventTypeString){for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||eventTypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--)}}},_removeHandler:function(i){var h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);JSEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDeferredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventHandler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.eventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.eventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData){var stackTop=stackSave();var varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThread,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:function(targetThread){switch(targetThread){case 1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return targetThread}},getNodeNameForTarget:function(target){if(!target)return"";if(target==window)return"#window";if(target==screen)return"#screen";return target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return document.fullscreenEnabled||document.webkitFullscreenEnabled}},function stringToNewUTF8(jsString){var length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return cString}function _emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var stackTop=stackSave();var varargs=stackAlloc(12);var targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32()[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[varargs+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestore(stackTop)}function _emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=ta

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getCanvas?UTF8ToString(targetCanvas):\":_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThre
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension("\ANGLE_instanced_arrays");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ex
t["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};
return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension("\OES_vertex_array_object");if(ext){ctx["createVertexArray"]=function(){return
ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension("\WEBGL_draw_buffers");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffers
WEBGL"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("\WEBGL_multi_dra
w"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source="\":for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-

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1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("\webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===undefined||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===undefined)JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\
EXT_disjoint_timer_query");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("lose_context")<0&&ext.inde
xOf("debug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)!="\"){name=name.slice(0,name.lastIndexOf("\["))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\["+j+"\]";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["default","low-power","high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32)[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32)[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32)[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32)[a+(52>>2)]];var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var

```

```

SYSCALLS={ mappings:{ },buffers:[null,[],[]],printChar:function(stream,curr){ var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{ buffer.push(curr) },varargs:undefined,get:function(){ SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){ var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low } };function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iiov,iiovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(5,1,fd,iiov,iiovcnt,pnum);var num=0;for(var i=0;i<iiovcnt;i++){ var
ptr=GROWABLE_HEAP_I32()[iiov+i*8>>2];var len=GROWABLE_HEAP_I32()[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){ var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){ wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\`"Internal Error! spawnThread()
can only ever be called from main application thread!\`;var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\`"Internal
error!\`;if(!threadParams.pthread_ptr)throw\`"Internal error, no pthread
ptr!\`;PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;+i){ GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={ worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={\`"cmd\`:\`"run\`,`"start_routine\`:threadParams.startRoutine,\`"arg\`:threadParams.arg,\`"threadInfoStruct\`:thre
adParams.pthread_ptr,\`"stackBase\`:threadParams.stackBase,\`"stackSize\`:threadParams.stackSize};worker.runPthre
ad=function(){ msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){ worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\`"undefined\`){err(\`"Current
environment does not support SharedArrayBuffer, pthreads are not available!\`");return
6}if(!pthread_ptr){err(\`"pthread_create called with a null thread pointer!\`");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){ return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){ stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{ stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-
=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var

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i=0;i<228>>2;++)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_ptr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw"Canceled!"}function
_emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce("Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread")}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err("pthread_join attempted on a null thread
pointer!");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()==thread){err("PThread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err("Main thread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err("pthread_join attempted on thread
\"+thread+\", which does not point to a valid thread, or does not exist anymore!");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("Attempted to join thread
\"+thread+\", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thre
ad_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator==="object")return navigator["hardwareConcurrency"]||1;return 1}}setErrNo(28);return-

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1 }if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wri
ite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,
\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscript
en_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap
ply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"
asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).app
ly(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul

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e["_Conv2DBackpropInput"]=Module["asm"]["U"].apply(null,arguments);var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["V"]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["W"]).apply(null,arguments);var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"]["X"]).apply(null,arguments);var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["Y"]).apply(null,arguments);var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"]["Z"]).apply(null,arguments);var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"]["_"]).apply(null,arguments);var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["$"]).apply(null,arguments);var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["aa"]).apply(null,arguments);var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["ba"]).apply(null,arguments);var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"]["ca"]).apply(null,arguments);var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["da"]).apply(null,arguments);var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["ea"]).apply(null,arguments);var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]["fa"]).apply(null,arguments);var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]["ga"]).apply(null,arguments);var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]["ha"]).apply(null,arguments);var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["ia"]).apply(null,arguments);var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["ja"]).apply(null,arguments);var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["ka"]).apply(null,arguments);var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["la"]).apply(null,arguments);var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["ma"]).apply(null,arguments);var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["na"]).apply(null,arguments);var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["oa"]).apply(null,arguments);var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["pa"]).apply(null,arguments);var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"]

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\["qa\"]).apply(null,arguments));var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm\"][\ra\"]).apply(null,arguments));var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm\"][\sa\"]).apply(null,arguments));var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm\"][\ta\"]).apply(null,arguments));var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm\"][\ua\"]).apply(null,arguments));var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm\"][\va\"]).apply(null,arguments));var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm\"][\wa\"]).apply(null,arguments));var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm\"][\xa\"]).apply(null,arguments));var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm\"][\ya\"]).apply(null,arguments));var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm\"][\za\"]).apply(null,arguments));var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm\"][\Aa\"]).apply(null,arguments));var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm\"][\Ba\"]).apply(null,arguments));var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm\"][\Ca\"]).apply(null,arguments));var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm\"][\Da\"]).apply(null,arguments));var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm\"][\Ea\"]).apply(null,arguments));var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm\"][\Fa\"]).apply(null,arguments));var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm\"][\Ga\"]).apply(null,arguments));var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm\"][\Ha\"]).apply(null,arguments));var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm\"][\Ia\"]).apply(null,arguments));var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm\"][\Ja\"]).apply(null,arguments));var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm\"][\Ka\"]).apply(null,arguments));var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm\"][\La\"]).apply(null,arguments));var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm\"][\Ma\"]).apply(null,arguments));var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm\"][\Na\"]).apply(null,arguments));var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith

```



```

Offset"]=Module["asm"]["Oa"].apply(null,arguments));var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"]["Pa"]).apply(nul
l,arguments));var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"]["Qa"]).apply(null,arg
uments));var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"]["Ra
"]).apply(null,arguments));var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"]["Sa"]).
apply(null,arguments));var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"]["Ta"]).ap
ply(null,arguments));var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"]["Ua"]).apply(null,arguments
);var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Va"]).a
pply(null,arguments));var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Wa"]).apply(null,argume
nts));var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Xa"]).apply(n
ull,arguments));var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"]["Ya"]).apply(null,arguments));var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Za"]).apply(null,argume
nts));var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"]["_a"]).apply(null,arguments));var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["$a"]).apply(null,argument
s));var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["ab"]).apply(null,argume
nts));var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["bb"]).apply(null,argument
s));var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["cb"]).apply(null,argu
ments));var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["db"]).apply(null,argument
s));var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["eb"]).apply(null,ar
guments));var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["fb
b"]).apply(null,arguments));var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["gb
b"]).apply(null,arguments));var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"]["hb"]).apply(null,arguments));var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["ib"]).apply(nul
l,arguments));var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["jb"]).apply(null,arguments
)};var
___errno_location=Module["___errno_location"]=function(){return(___errno_location=Module["___errno_locati

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on"]=Module["asm"][["kb"]].apply(null,arguments));var
_emsripten_get_global_libc=Module["_emsripten_get_global_libc"]=function(){return(_emsripten_get_global
_libc=Module["_emsripten_get_global_libc"]=Module["asm"][["lb"]].apply(null,arguments));var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["as
m"][["mb"]].apply(null,arguments));var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=M
odule["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]].apply(null,arguments));var
_emsripten_main_thread_process_queued_calls=Module["_emsripten_main_thread_process_queued_calls"]=fu
nction(){return(_emsripten_main_thread_process_queued_calls=Module["_emsripten_main_thread_process_que
ued_calls"]=Module["asm"][["ob"]].apply(null,arguments));var
_emsripten_current_thread_process_queued_calls=Module["_emsripten_current_thread_process_queued_calls"]
=function(){return(_emsripten_current_thread_process_queued_calls=Module["_emsripten_current_thread_proc
ess_queued_calls"]=Module["asm"][["pb"]].apply(null,arguments));var
_emsripten_register_main_browser_thread_id=Module["_emsripten_register_main_browser_thread_id"]=functi
on(){return(_emsripten_register_main_browser_thread_id=Module["_emsripten_register_main_browser_thread_
id"]=Module["asm"][["qb"]].apply(null,arguments));var
_emsripten_main_browser_thread_id=Module["_emsripten_main_browser_thread_id"]=function(){return(_ems
ripten_main_browser_thread_id=Module["_emsripten_main_browser_thread_id"]=Module["asm"][["rb"]].app
ly(null,arguments));var
__emsripten_do_dispatch_to_thread=Module["__emsripten_do_dispatch_to_thread"]=function(){return(__ems
ripten_do_dispatch_to_thread=Module["__emsripten_do_dispatch_to_thread"]=Module["asm"][["sb"]].apply(n
ull,arguments));var
_emsripten_sync_run_in_main_thread_4=Module["_emsripten_sync_run_in_main_thread_4"]=function(){retur
n(_emsripten_sync_run_in_main_thread_4=Module["_emsripten_sync_run_in_main_thread_4"]=Module["asm\
"][["tb"]].apply(null,arguments));var
_emsripten_run_in_main_runtime_thread_js=Module["_emsripten_run_in_main_runtime_thread_js"]=function(
){return(_emsripten_run_in_main_runtime_thread_js=Module["_emsripten_run_in_main_runtime_thread_js"]=
Module["asm"][["ub"]].apply(null,arguments));var
__emsripten_call_on_thread=Module["__emsripten_call_on_thread"]=function(){return(__emsripten_call_on_t
hread=Module["__emsripten_call_on_thread"]=Module["asm"][["vb"]].apply(null,arguments));var
_emsripten_tls_init=Module["_emsripten_tls_init"]=function(){return(_emsripten_tls_init=Module["_emsc
ripten_tls_init"]=Module["asm"][["wb"]].apply(null,arguments));var
__emsripten_thread_init=Module["__emsripten_thread_init"]=function(){return(__emsripten_thread_init=Mod
ule["__emsripten_thread_init"]=Module["asm"][["xb"]].apply(null,arguments));var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["yb"]].a
pply(null,arguments));var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm\
"][["zb"]].apply(null,arguments));var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ab\
"]].apply(null,arguments));var
_emsripten_stack_set_limits=Module["_emsripten_stack_set_limits"]=function(){return(_emsripten_stack_set
_limits=Module["_emsripten_stack_set_limits"]=Module["asm"][["Bb"]].apply(null,arguments));var
_memalign=Module["_memalign"]=function(){return(_memalign=Module["_memalign"]=Module["asm"][["Cb\
"]].apply(null,arguments));var
__emsripten_allow_main_runtime_queued_calls=Module["__emsripten_allow_main_runtime_queued_calls"]=1
0512;var
__emsripten_main_thread_futex=Module["__emsripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap
;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module

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if(e.data.target===\"setimmediate\")} else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()} } else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)} } catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex } };if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href: __filename } };var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){ onmessage({ data:data })});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){ parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}};\"\\nvar
WasmBackendModule = (function() {\\n var _scriptId = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\\n if (typeof __filename !== 'undefined')
_scriptId = _scriptId || __filename;\\n return (\\nfunction(WasmBackendModule) {\\n WasmBackendModule =
WasmBackendModule || {};\\n\\nvar Module=typeof
WasmBackendModule!=\"undefined\"?WasmBackendModule: {} ;var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"] =new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){ moduleOverrides[key]=Module[key]} } var arguments_=[];var
thisProgram= \"/.this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"} else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\\\\\/g,\"/\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex } });process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inSp
ect\"] =function() {return \"[Emscripten Module object]\"} } else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\") {read_=function shell_read(f) {return read(f)} } readBinary=function readBinary(f) { var
data;if(typeof readbuffer===\"function\") {return new
Uint8Array(readbuffer(f))} data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\") {arguments_=scriptArgs} else if(typeof
arguments!=\"undefined\") {arguments_=arguments} if(typeof
quit===\"function\") {quit_=function(status){ quit(status)} } if(typeof print!=\"undefined\") {if(typeof

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console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print} else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href} else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!=0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"^\")+1)}else{scriptDirectory=\"\"}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} else{var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"]arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"]thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"]quit_=Module[\"quit\"];var
wasmBinary;if(Module[\"wasmBinary\"]wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!=\"object\"){abort(\"no native wasm
support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str!=\"null\"&&str!=\"undefined\"&&str!=\"0\"){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!=\"0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!=\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!=\"undefined\"?new TextDecoder(\"utf8\"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))} else{var
str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2} else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function

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stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAtAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=nul
l}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the

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wasm failed\"} }catch(err){ abort(err)} }function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
\"+wasmBinaryFile+\"\"}return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)}})else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))}}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)}})function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-
instantiate\")}addRunDependency(\"wasm-instantiate\");function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err(\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iiovcnt,pnum){var num=0;for(var
i=0;i<iiovcnt;i++){var ptr=HEAP32[iiov+i*8>>2];var len=HEAP32[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function

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 pthread_create(){return 6}function pthread_join(){return 28}function
 setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
 _sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
 maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
 1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
 navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
 asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
 d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
 ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
 _call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
 _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
 var
 _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
 ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
 _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
 _count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
 _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
 odule[\"asm\"][\"o\"]).apply(null,arguments)};var
 _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
 asm\"][\"p\"]).apply(null,arguments)};var
 _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
 ull,arguments)};var
 _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
 _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
 s)};var
 _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar
 guments)};var
 _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};
 var
 _Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
 ts)};var
 _ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).app
 ly(null,arguments)};var
 _AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).a
 pply(null,arguments)};var
 _BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
 le[\"asm\"][\"z\"]).apply(null,arguments)};var

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_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][_"A"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][_"B"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][_"C"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["asm"][_"D"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][_"E"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][_"F"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["asm"][_"G"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["asm"][_"H"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["asm"][_"I"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["asm"][_"J"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["asm"][_"K"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["asm"][_"L"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["asm"][_"M"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["asm"][_"N"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["asm"][_"O"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["asm"][_"P"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["asm"][_"Q"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["asm"][_"R"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["asm"][_"S"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["asm"][_"T"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["asm"][_"U"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["asm"][_"V"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["asm"][_"W"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["asm"][_"X"]).apply(null,arguments)};var

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_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"Y"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"Z"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_" _"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"$"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"aa"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"ba"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"da"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"ga"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ha"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"ia"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][_"ja"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][_"ka"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][_"la"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][_"ma"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][_"na"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"ta"]).apply(null,arguments)};var

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_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Ea"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ha"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["La"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["Ra"]]).apply(null,arguments)};var

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__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"][["Sa"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["Ta"]]).apply(nu
ll,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["Ua"]]).apply(null,argument
s)};var
___errno_location=Module["___errno_location"]=function(){return(___errno_location=Module["___errno_locati
on"]=Module["asm"][["Va"]]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["Wa"]]).
apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][["Xa"]]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ya"
]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"]("\n"),1});doRun(),1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}}run();\n\n return WasmBackendModule.ready\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport './flags_wasm';\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
 './wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:

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number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n numDataIds(): number {\n return this.dataIdMap.numDataIds();\n }\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start = util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n move(\n dataId: DataId, values: backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n const id = this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n }\n return;\n }\n const size = util.sizeFromShape(shape);\n const numBytes = size * util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n memoryOffset);\n }\n }\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return this.readSync(dataId);\n }\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset, dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n }\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n }\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data = this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n }\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n this.dataIdMap.delete(dataId);\n }\n return true;\n }\n /** Return refCount of a `TensorData`. */\n refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData = this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n incRef(dataId: DataId) {\n const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n floatPrecision(): 32 {\n return 32;\n }\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n getMemoryOffset(dataId: DataId): number {\n return this.dataIdMap.get(dataId).memoryOffset;\n }\n dispose() {\n this.wasm.tfjs.dispose();\n if ('PThread' in this.wasm) {\n this.wasm.PThread.terminateAllThreads();\n }\n this.wasm = null;\n }\n memory() {\n return {unreliable: false};\n }\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n TensorInfo {\n let dataId: {};\n if (memoryOffset == null) {\n dataId = this.write(null /* values */, shape, dtype);\n } else {\n const id = this.dataIdNextNumber++;\n dataId = {id};\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n const size = util.sizeFromShape(shape);\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n }\n return {dataId, shape, dtype};\n }\n typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n backend_util.TypedArray {\n const buffer = this.wasm.HEAPU8.buffer;\n const {memoryOffset} = this.dataIdMap.get(dataId);\n const size = util.sizeFromShape(shape);\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer, memoryOffset, size);\n case 'int32':\n return new Int32Array(buffer, memoryOffset, size);\n case 'bool':\n return new Uint8Array(buffer, memoryOffset, size);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n }\n function createInstantiateWasmFunc(path: string) {\n // this will be replace by rollup plugin patchWechatWebAssembly in\n // miniprogram's output.\n // tslint:disable-next-line:no-any\n return (imports: any, callback: any) => {\n util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n if (!response['ok']) {\n imports.env.a^ failed to load wasm binary file at '${path}';\n }\n response.arrayBuffer().then(binary => {\n WebAssembly.instantiate(binary, imports).then(output => {\n callback(output.instance, output.module);\n });\n });\n });\n };

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});\n });\n });\n return {};\n };\n}\n\n/**\n * Returns the path of the WASM binary.\n * @param\n simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n simdSupported: boolean, threadsSupported: boolean,\n wasmModuleFolder: string) {\n if (wasmPath != null) {\n // If wasmPath is defined, the user has supplied a full path to\n // the vanilla .wasm binary.\n return\n wasmPath;\n }\n let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n if (simdSupported &&\n threadsSupported) {\n path = 'tfjs-backend-wasm-threaded-simd.wasm';\n } else if (simdSupported) {\n path =\n 'tfjs-backend-wasm-simd.wasm';\n }\n if (wasmFileMap != null) {\n if (wasmFileMap[path] != null) {\n return wasmFileMap[path];\n }\n }\n return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm\n module and creates the js <--> wasm bridge.\n * NOTE: We wrap the wasm module in a object with property\n 'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in\n Chrome 76).\n */\nexport async function init(): Promise<{ wasm: BackendWasmModule}> {\n const\n [simdSupported, threadsSupported] = await Promise.all([\n env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n]);\n return new Promise((resolve, reject) =>\n {\n const factoryConfig: WasmFactoryConfig = {};\n /**\n * This function overrides the Emscripten\n module locateFile utility.\n * @param path The relative path to the file that needs to be loaded.\n * @param\n prefix The path to the main JavaScript file's directory.\n */\n factoryConfig.locateFile = (path, prefix) => {\n if (path.endsWith('.worker.js')) {\n const response = wasmWorkerContents;\n const blob = new\n Blob([response], {type: 'application/javascript'});\n return URL.createObjectURL(blob);\n }\n if\n (path.endsWith('.wasm')) {\n return getPathToWasmBinary(\n simdSupported as boolean,\n threadsSupported as boolean,\n wasmPathPrefix != null ? wasmPathPrefix : prefix);\n }\n return prefix\n + path;\n };\n // Use the instantiateWasm override when system fetch is not available.\n // Reference:\n // https://github.com/emscripten-\n core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n if (customFetch) {\n factoryConfig.instantiateWasm =\n createInstantiateWasmFunc(getPathToWasmBinary(\n simdSupported as boolean, threadsSupported as\n boolean,\n wasmPathPrefix != null ? wasmPathPrefix : ''));\n }\n let initialized = false;\n factoryConfig.onAbort = () => {\n if (initialized) {\n // Emscripten already called console.warn so no need to\n double log.\n return;\n }\n if (initAborted) {\n // Emscripten calls `onAbort` twice, resulting in double\n error\n // messages.\n return;\n }\n initAborted = true;\n const rejectMsg =\n 'Make sure the\n server can serve the `.wasm` file relative to the '+\n 'bundled js file. For more details see\n https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n reject({message: rejectMsg});\n };\n let wasm: Promise<BackendWasmModule>;\n // If `wasmPath` has\n been defined we must initialize the vanilla module.\n if (threadsSupported && simdSupported && wasmPath ==\n null) {\n factoryConfig.mainScriptUrlOrBlob = new Blob([\n [var WasmBackendModuleThreadedSimd =\n +\n wasmFactoryThreadedSimd.toString()],\n {type: 'text/javascript'}];\n);\n wasm =\n wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD\n binaries.\n wasm = wasmFactory(factoryConfig);\n }\n // The WASM module has been successfully\n created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string =\n null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init:\n module.cwrap('init', null, []),\n initWithThreadsCount:\n module.cwrap('init_with_threads_count', null,\n ['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor:\n module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n],\n),\n disposeData: module.cwrap('dispose_data', voidReturnType,\n ['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n resolve({ wasm: module });\n });\n });\n }\n}\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType):\n backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case

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'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-wasm.wasm',\n 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n */\n * @doc {heading: 'Environment', namespace: 'wasm'}\n * ^\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n 'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n ' will be removed in a future release.);\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n }\n wasmPath = path;\n customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n */\n * ``js\n * setWasmPaths({\n * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ``\n */\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n */\n * @doc {heading: 'Environment', namespace: 'wasm'}\n * ^\nexport function setWasmPaths(\n prefixOrFileMap: string | {[key in WasmBinaryName]?: string},\n usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n '`tf.ready()`);\n }\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix = prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n customFetch = usePlatformFetch;\n}\n\n/**\n * Used in unit tests.\n */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n */\n * This must be called before calling\n * `tf.setBackend('wasm')`\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n */\n * It is set after the backend is initialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n throw new Error('WASM backend not initialized.);\n }\n return actualThreadsCount;\n}\n\n",\n * @license See the LICENSE file.\n */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n\n",\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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*\\n\\nimport './flags_wasm';\\n\\nimport {registerBackend} from '@tensorflow/tfjs-core';\\n\\nimport {BackendWasm,
init} from './backend_wasm';\\n\\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\\n\\nexport {version as version_wasm} from './version';\\n\\nconst
WASM_PRIORITY = 2;\\nregisterBackend('wasm', async () => {\\n const {wasm} = await init();\\n return new
BackendWasm(wasm);\\n},
WASM_PRIORITY);\\n}], "names":["_FusedMatMul","util","Abs","backend_util","Add","AddN","Identity","setup",
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DBackpropInput","Cos","Cosh","CropAndResize","Cumsum","DepthToSpace","DepthwiseConv2dNative","Elu","s
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AE,UAAU,EAAE,WAAW,EAAE,OAAO,EAAE,OAAO,EACtE,OAAO,EAAE,SAAS,EAAE,UAAU,CAAC,MAA  
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axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n util.assert(\n dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const
expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n }\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n"}\n
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Pack.js.map
```

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Log.js","sourceRoot":"","sources":["../../src/kernels/Log.ts"],"names":[],"mappings":"AAAA;;;
;;;;;;;;;GAeG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EA
AC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,SAAS,GAAiB,uBAAuB,CAAC,GAAG,CAAC,CA
AC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\\n
```

```
*\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n"}\n
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Log.js.map
```

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Pow.js","sourceRoot":"","sources":["../../src/kernels/Pow.ts"],"names":[],"mappings":"AAAA;;;
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SAAS,GACiB,wBAAwB,CAAC,GAAG,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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the specific language governing permissions and\n * limitations under the License.\n *
=====\\n
```

```

*\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\ncreateBinaryKernelConfig(Pow, supportsFullBroadcast);\n"}

```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pow.js.map

No license file was found, but licenses were detected in source scan.

```

{"version":3,"file":"SplitV.js","sourceRoot":"","sources":["../../src/kernels/SplitV.ts"],"names":[],"mappings":"AAA
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the specific language governing permissions and\n * limitations under the License.\n *
=====

```

```

*\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {\n const {inputs, attrs, backend} = args;\n const {x} = inputs;\n const
{numOrSizeSplits, axis} = attrs;\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n
const size = x.shape.slice();\n return splitSizes.map(s => {\n const xSliceSize = [...size];\n xSliceSize[$axis] =
s;\n const xSlice =\n slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n begin[$axis] += s;\n });\n return xSlice;\n});\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName:
'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n"}

```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SplitV.js.map

No license file was found, but licenses were detected in source scan.

```
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C","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\\n
*/\\n\\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
 '@tensorflow/tfjs-core';\\n\\nimport {BackendWasm} from '../backend_wasm';\\n\\nlet wasmTransform: (\\n imageId:
number, transformsId: number, isBatchTransform: boolean,\\n batch: number, outHeight: number, outWidth:
number, numChannels: number,\\n imageWidth: number, imageHeight: number, strides: Uint8Array,\\n
stridesLength: number, interpolationModeId: number, fillModeId: number,\\n fillValue: number, outId: number)
=> void;\\n\\nfunction setup(backend: BackendWasm): void {\\n wasmTransform = backend.wasm.cwrap(Transform,
null /*void*/, [\\n 'number', // imageId\\n 'number', // transformsId\\n 'bool', // isBatchTransform\\n 'number',
// batch\\n 'number', // outHeight\\n 'number', // outWidth\\n 'number', // numChannels\\n 'number', //
imageWidth\\n 'number', // imageHeight\\n 'array', // strides\\n 'number', // stridesLength\\n 'number', //
interpolationModeId\\n 'number', // fillModeId\\n 'number', // fillValue\\n 'number' // outId\\n
]);\\n}\\n\\nfunction transform(\\n args: \\n {backend: BackendWasm, inputs: TransformInputs, attrs:
```

```

TransformAttrs}};\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape :\n [imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as\n [number, number, number, number];\n const strides =\n new Uint8Array(new\n Int32Array(util.computeStrides(image.shape)).buffer);\n const out = backend.makeOutput(outShape,\n image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const imageData =\n backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n const transformsData =\n backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n const\n interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case 'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n }\n break;\n }\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId,\n fillModeId, fillValue,\n outId);\n }\n next export const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as { } as\n KernelFunc\n };

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transform.js.map

```

No license file was found, but licenses were detected in source scan.

```

{"version":3,"file":"Multiply.js","sourceRoot":"","sources":["../../src/kernels/Multiply.ts"],"names":[],"mappings":"
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
\n
\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Multiply.js.map

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No license file was found, but licenses were detected in source scan.

```

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```

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```
=====\n*\n\nimport { ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', // max\n 'number' // out_id\n]);\n\n function clip(args: {\n inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n }) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n }\n\n export const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as KernelFunc\n };
}
```

Found in path(s):

`/opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ClipByValue.js.map`

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```

```
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 * =====
```

```
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 * =====
```

```
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 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 * =====
```



```

*/
/**
 * @deprecated Use `setWasmPaths` instead.
 * Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch to download
 * the wasm file, default to false.
 *
 * @doc {heading: 'Environment', namespace: 'wasm'}
*/

```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
zip/tfjs-backend-wasm/dist/tf-backend-wasm.es2017.js

```

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n\n function sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs});\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n }\n\n export const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as { } as KernelFunc\n };
}
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Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sigmoid.js.map

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AAE,CAAC;AACzD,IAAI,WAAW,GAAG,KAAK,CAAC;AACxB,IAAI,WAAW,GAAG,KAAK,CAAC;AAExB;;  
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,8DAA8D;QAC9D,uCAAuC,CAAC,CAAC;IAC7C,IAAI,WAAW,EAAE;QACf,MAAM,IAAI,KAAK,CACX,+D  
AA+D;YAC/D,mEAAmE,CAAC,CAAC;KAC1E;IACD,QAAQ,GAAG,IAAI,CAAC;IACHB,WAAW,GAAG,gBA  
AgB,CAAC;AACjC,CAAC;AAED;;;;;;GAWBG;AACH,MAAM,UAAU,YAAY,CACxB,eAAOD,EAC  
1D,gBAAgB,GAAG,KAAK;IAC1B,IAAI,WAAW,EAAE;QACf,MAAM,IAAI,KAAK,CACX,+DAA+D;YAC/D,

wDAAwD;YACxD,cAAc,CAAC,CAAC;KACrB;IAED,IAAI,OAAO,eAAe,KAAK,QAAQ,EAAE;QACvC,cAAc,GAAG,eAAe,CAAC;KACIC;SAAM;QACL,WAAW,GAAG,eAAe,CAAC;QAC9B,MAAM,YAAY,GACd,eAAe,CAAC,MAAM,CAAC,IAAI,CAAC,EAAE,CAAC,WAAW,CAAC,IAAI,CAAC,IAAI,IAAI,CAAC,CAAC;QAC9D,IAAI,YAAY,CAAC,MAAM,GAAG,CAAC,EAAE;YAC3B,MAAM,IAAI,KAAK,CACX,0DAA0D;gBAC1D,G AAG,YAAY,CAAC,IAAI,CAAC,GAAG,CAAC,2CAA2C;gBACpE,oEAAoE;gBACpE,oDAAoD,CAAC,CAAC;S AC3D;KACF;IAED,WAAW,GAAG,gBAAGB,CAAC;AACjC,CAAC;AAED,0BAA0B;AAC1B,MAAM,UAAU,a AAa;IAC3B,QAAQ,GAAG,IAAI,CAAC;IACbB,cAAc,GAAG,IAAI,CAAC;IACtB,WAAW,GAAG,EAAE,CAAC ;IACjB,WAAW,GAAG,KAAK,CAAC;IACpB,WAAW,GAAG,KAAK,CAAC;AACtB,CAAC;AAED,IAAI,YAAY ,GAAG,CAAC,CAAC,CAAC;AACtB,IAAI,kBAaKB,GAAG,CAAC,CAAC,CAAC;AAE5B;;;;GAKG;AACH,M AAM,UAAU,eAAe,CAAC,UAAkB;IACbD,YAAY,GAAG,UAAU,CAAC;AAC5B,CAAC;AAED;;;GAIG;AACH ,MAAM,UAAU,eAAe;IAC7B,IAAI,kBAaKB,KAAK,CAAC,CAAC,EAAE;QAC7B,MAAM,IAAI,KAAK,CAAC, +BAA+B,CAAC,CAAC;KACID;IACD,OAAO,kBAaKB,CAAC;AAC5B,CAAC", "sourcesContent":["/\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n *\\nimport './flags_wasm';\\n\\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn, engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\\n\\nimport {BackendWasmModule, WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\\nimport {BackendWasmThreadedSimdModule} from './wasm-out/tfjs-backend-wasm-threaded-simd';\\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-backend-wasm-threaded-simd.js';\\n// @ts-ignore\\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\\n\\ninterface TensorData {\\n id: number;\\n memoryOffset: number;\\n shape: number[];\\n dtype: DataType;\\n refCount: number;\\n /** Only used for string tensors, storing encoded bytes. */\\n stringBytes?: Uint8Array[];\\n}\\n\\nexport type DataId = object; // object instead of {} to force non-primitive.\\n\\nexport class BackendWasm extends KernelBackend {\\n // 0 is reserved for null data ids.\\n private dataIdNextNumber = 1;\\n dataIdMap: DataStorage<TensorData>;\\n constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\\n super();\\n this.wasm.tfjs.initWithThreadsCount(threadsCount);\\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\\n this.dataIdMap = new DataStorage(this, engine());\\n }\\n write(values: backend_util.BackendValues, shape: number[], dtype: DataType): DataId {\\n const dataId = {id: this.dataIdNextNumber++};\\n this.move(dataId, values, shape, dtype, 1);\\n return dataId;\\n }\\n numDataIds(): number {\\n return this.dataIdMap.numDataIds();\\n }\\n async time(f: () => void): Promise<BackendTimingInfo> {\\n const start = util.now();\\n f();\\n const kernelMs = util.now() - start;\\n return {kernelMs};\\n }\\n move(dataId: DataId, values: backend_util.BackendValues, shape: number[], dtype: DataType, refCount: number): void {\\n const id = this.dataIdNextNumber++;\\n if (dtype === 'string') {\\n const stringBytes = values as Uint8Array[];\\n this.dataIdMap.set(dataId, {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\\n }\\n const size = util.sizeFromShape(shape);\\n const numBytes = size * util.bytesPerElement(dtype);\\n const memoryOffset = this.wasm._malloc(numBytes);\\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\\n if (values != null) {\\n this.wasm.HEAPU8.set(new Uint8Array(values as backend_util.TypedArray).buffer, (values as backend_util.TypedArray).byteOffset, numBytes, memoryOffset);\\n }\\n }\\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\\n return this.readSync(dataId);\\n }\\n readSync(dataId: DataId): backend_util.BackendValues {\\n const {memoryOffset, dtype, shape, stringBytes} = this.dataIdMap.get(dataId);\\n if (dtype === 'string') {\\n return stringBytes;\\n }
```

```

 }\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n
}\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false
otherwise.\n * @param dataId\n * @param force Optional, remove the data regardless of refCount\n */\n
disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data =
this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n
}\n\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n
this.dataIdMap.delete(dataId);\n }\n return true;\n }\n\n /** Return refCount of a `TensorData`. */\n
refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData =
this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n\n incRef(dataId: DataId) {\n
const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n\n floatPrecision():
32 {\n return 32;\n }\n\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n
getMemoryOffset(dataId: DataId): number {\n return this.dataIdMap.get(dataId).memoryOffset;\n }\n\n
dispose() {\n this.wasm.tfjs.dispose();\n if ('PThread' in this.wasm) {\n
this.wasm.PThread.terminateAllThreads();\n }\n this.wasm = null;\n }\n\n memory() {\n return {unreliable:
false};\n }\n\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated
elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n
makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):\n TensorInfo {\n let dataId: {};\n if (memoryOffset
== null) {\n dataId = this.write(null /* values */, shape, dtype);\n } else {\n const id =
this.dataIdNextNumber++;\n dataId = {id};\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});\n const size = util.sizeFromShape(shape);\n this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n }\n return {dataId, shape, dtype};\n }\n\n typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n backend_util.TypedArray {\n const buffer = this.wasm.HEAPU8.buffer;\n const
{memoryOffset} = this.dataIdMap.get(dataId);\n const size = util.sizeFromShape(shape);\n switch (dtype) {\n
case 'float32':\n return new Float32Array(buffer, memoryOffset, size);\n case 'int32':\n return new
Int32Array(buffer, memoryOffset, size);\n case 'bool':\n return new Uint8Array(buffer, memoryOffset,
size);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n }\n\n\nfunction
createInstantiateWasmFunc(path: string) {\n // this will be replace by rollup plugin patchWechatWebAssembly in\n
// miniprogram's output.\n // tslint:disable-next-line:no-any\n return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n }\n response.arrayBuffer().then(binary => {\n
WebAssembly.instantiate(binary, imports).then(output => {\n callback(output.instance, output.module);\n
});\n });\n });\n return {};\n }\n }\n\n\n /**\n * Returns the path of the WASM binary.\n */\n
@param
simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n *
@param wasmModuleFolder the directory containing the WASM binaries.\n */\n
function getPathToWasmBinary(\n simdSupported: boolean, threadsSupported: boolean,\n wasmModuleFolder: string) {\n if (wasmPath != null) {\n
// If wasmPath is defined, the user has supplied a full path to\n // the vanilla .wasm binary.\n return
wasmPath;\n }\n\n let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n if (simdSupported &&
threadsSupported) {\n path = 'tfjs-backend-wasm-threaded-simd.wasm';\n } else if (simdSupported) {\n path =
'tfjs-backend-wasm-simd.wasm';\n }\n\n if (wasmFileMap != null) {\n if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n }\n }\n\n return wasmModuleFolder + path;\n }\n }\n\n\n /**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n */\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in
Chrome 76).\n */\n
export async function init(): Promise<{wasm: BackendWasmModule}> {\n const
[simdSupported, threadsSupported] = await Promise.all([\n env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n]);\n\n return new Promise((resolve, reject) =>
{\n const factoryConfig: WasmFactoryConfig = {};\n\n /**\n * This function overrides the Emscripten

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```

module locateFile utility.\n * @param path The relative path to the file that needs to be loaded.\n * @param
prefix The path to the main JavaScript file's directory.\n */\n factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n const response = wasmWorkerContents;\n const blob = new
Blob([response], {type: 'application/javascript'});\n return URL.createObjectURL(blob);\n }\n\n if
(path.endsWith('.wasm')) {\n return getPathToWasmBinary(\n simdSupported as boolean,
threadsSupported as boolean,\n wasmPathPrefix != null ? wasmPathPrefix : prefix);\n }\n return prefix
+ path;\n };\n\n // Use the instantiateWasm override when system fetch is not available.\n // Reference:\n //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n factoryConfig.instantiateWasm =\n createInstantiateWasmFunc(getPathToWasmBinary(\n simdSupported as boolean, threadsSupported as
boolean,\n wasmPathPrefix != null ? wasmPathPrefix : ''));\n }\n\n let initialized = false;\n
factoryConfig.onAbort = () => {\n if (initialized) {\n // Emscripten already called console.warn so no need to
double log.\n return;\n }\n if (initAborted) {\n // Emscripten calls `onAbort` twice, resulting in double
error\n // messages.\n return;\n }\n initAborted = true;\n const rejectMsg =\n 'Make sure the
server can serve the `.wasm` file relative to the '+\n 'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers;\n
reject({message: rejectMsg});\n };\n\n let wasm: Promise<BackendWasmModule>;\n // If `wasmPath` has
been defined we must initialize the vanilla module.\n if (threadsSupported && simdSupported && wasmPath ==
null) {\n factoryConfig.mainScriptUrlOrBlob = new Blob(\n [\n var WasmBackendModuleThreadedSimd = `
+\n wasmFactoryThreadedSimd.toString(),\n {type: 'text/javascript'});\n wasm =
wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD
binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully
created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n\n
wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string =
null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init:
module.cwrap('init', null, []),\n initWithThreadsCount:\n module.cwrap('init_with_threads_count', null,
['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor:
module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n
 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n\n resolve({wasm: module});\n
 });\n\n });\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case
'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n
throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\nconst
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n */\n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n ' will be removed in a future release.);\n if
(initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n
 '^setWasmPath(` before you call `tf.setBackend()` or `tf.ready()`);\n }\n\n wasmPath = path;\n customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n */\n * ```\n * setWasmPaths({\n

```

```

* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
``\n *\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n *
full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading:
'Environment', namespace: 'wasm'}\n *\nexport function setWasmPaths(\n prefixOrFileMap: string|{[key in
WasmBinaryName]?: string},\n usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error(\n
'The WASM backend was already initialized. Make sure you call ' +\n `setWasmPaths()` before you call
`tf.setBackend()` or ' +\n `tf.ready()`);\n }\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix
= prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new
Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}. Please
either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n
 `the directory where all the binaries can be found.`);\n }\n }\n customFetch = usePlatformFetch;\n}\n\n/**
Used in unit tests. *\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n
wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet
actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n *
threadpool (default to the number of logical CPU cores).\n * This must be called before calling
`tf.setBackend('wasm')`.\n *\nexport function setThreadsCount(numThreads: number) {\n threadsCount =
numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n * It is set after the
backend is intialized.\n *\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n
throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n\n"]

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/backend_wasm.js.map

```

No license file was found, but licenses were detected in source scan.

```

{"version":3,"file":"Rsqrt.js","sourceRoot":"","sources":["../../src/kernels/Rsqrt.ts"],"names":[],"mappings":"AAAA;
;;;;;;;;;;GAeG;AACH,OAAO,EAAe,KAAK,EAAC,MAAM,uBAAuB,CAAC;AAE1D,OAAO,EAAC,uBAAuB,E
AAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,WAAW,GAAiB,uBAAuB,CAAC,KAAK,CAAC,
CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);"]

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Rsqrt.js.map

```



No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Less.js","sourceRoot":"","sources":["../../src/kernels/Less.ts"],"names":[],"mappings":"AAAA;;;
;;;;;;;;;;GAeG;AACH,OAAO,EAAe,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAEzD,OAAO,EAAC,wBAAwB,EA
AC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,KAAK,CAAC;AACpC,MAAM,CAAC,MAAM,U
AAU,GACnB,wBAAwB,CAAC,IAAI,EAAE,qBAAqB,EAAE,MAAM,CAAC,CAAC","sourcesContent":["/**\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\ncreateBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Less.js.map

No license file was found, but licenses were detected in source scan.

```
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AAoB;IACrC,QAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,SAAS,EAAE,IAAI,CAAC,UAAU,EAAE
;QACxD,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;KACT,CAAC,CAAC;AACL,CAAC;AAED,MAA
M,UAAU,SAAS,CACrB,IAC0E;IAE5E,MAAM,EAAC,MAAM,EAAE,EAAC,CAAC,EAAC,EAAE,KAAK,EAA
E,EAAC,KAAK,EAAC,EAAE,OAAO,EAAC,GAAG,IAAI,CAAC;IAEpD,MAAM,GAAG,GAAG,OAAO,CAAC,
SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/C,8EAA8E;IAC9E,YAA
Y;IACZ,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,CAAC,KAAK,EAAE,SAAS,CAAC,CAAC;IA
EnD,IAAI,IAAI,CAAC,aAAa,CAAC,CAAC,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;QACrC,MAAM,KAAK,
GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACnD,
QAAQ,CAAC,GAAG,EAAE,QAAQ,CAAC,CAAC,CAAC,KAAK,CAAC,EAAE,KAAK,EAAE,KAAK,CAAC,C
AAC;KAChD;IAED,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,eAAe,GAAiB;IAC3C,U
AAU,EAAE,SAAS;IACrB,WAAW,EAAE,MAAM;IACnB,SAAS;IACT,UAAU,EAAE,SAA6B;CAC1C,CAAC","
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from
 './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
```



vC,CAAC,SAAS,EAAE,WAAW,EAAE,WAAW,CAAC,CAAC;IAEpE,0EAA0E;IAC1E,MAAM,GAAG,GAAG, OAAO,CAAC,EAAC,MAAM,EAAE,EAAC,CAAC,EAAE,CAAC,EAAC,EAAE,OAAO,EAAE,KAAK,EAAE,EA AC,KAAK,EAAE,QAAQ,EAAC,EAAC,CAAC,CAAC;IACzE,MAAM,GAAG,GAAG,OAAO,CAAC,EAAC,MA AM,EAAE,EAAC,CAAC,EAAE,CAAC,EAAC,EAAE,OAAO,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,QAAQ ,EAAC,EAAC,CAAC,CAAC;IAEzE,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG, CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IACnD,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG, CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAEnD,MAAM,OAAO,GAAG,UAAU,CAAC,CAAC, CAAC,GAAG,CAAC,KAAK,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,GAAG,CAAC,KAAK,CAAC,CAAC,C AAC,CAAC;IACzD,MAAM,QAAQ,GAAG,UAAU,CAAC,CAAC,CAAC,GAAG,CAAC,KAAK,CAAC,CAAC,C AAC,CAAC,CAAC,CAAC,GAAG,CAAC,KAAK,CAAC,CAAC,CAAC,CAAC;IAC1D,MAAM,QAAQ,GAAG,I AAI,CAAC,GAAG,CAAC,SAAS,EAAE,SAAS,CAAC,CAAC;IAEhD,MAAM,GAAG,GAAG,OAAO,CAAC,UA AU,CAAC,CAAC,QAAQ,EAAE,OAAO,EAAE,QAAQ,CAAC,EAAE,GAAG,CAAC,KAAK,CAAC,CAAC;IACz E,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAA E,CAAC;IAEnD,MAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,GAAG,CAAC,KAAK,CAAC, CAAC,MAAM,CAAC,CAAC;IACrE,MAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,GAAG,C AAC,KAAK,CAAC,CAAC,MAAM,CAAC,CAAC;IAErE,eAAe,CACX,KAAK,EAAE,WAAW,EAAE,GAAG,CA AC,KAAK,CAAC,MAAM,EAAE,KAAK,EAAE,WAAW,EACxD,GAAG,CAAC,KAAK,CAAC,MAAM,EAAE,U AAU,EAAE,UAAU,EAAE,KAAK,CAAC,CAAC;IAErD,OAAO,CAAC,WAAW,CAAC,GAAG,CAAC,MAAM,C AAC,CAAC;IAChC,OAAO,CAAC,WAAW,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC;IAEhC,GAAG,CAAC, KAAK,GAAG,QAAQ,CAAC;IACrB,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,iBAAi B,GAAiB;IAC7C,UAAU,EAAE,WAAW;IACvB,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KAAK;IAChB,U AAU,EAAE,WAA+B;CAC5C,CAAC", "sourcesContent":["/\*\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \*\n \* http://www.apache.org/licenses/LICENSE-2.0\n \*\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*\n \*=====\n \*\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend\_wasm';\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number, bShape: Uint8Array, bShapeSize: number, transposeA: boolean, transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /\* void \*/, [\n 'number', // a\_id\n 'array', // a\_shape\n 'number', // a\_shape.length\n 'number', // b\_id\n 'array', // b\_shape\n 'number', // b\_shape.length\n 'number', // transpose\_a\n 'number', // transpose\_b\n 'number' // out\_id\n ]);\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const [a, b] = inputs;\n const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(`BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input batch dimensions must either be the ` +\n `same or at least one input batch dimension must be 1. Got input `

```

+\n `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\nbatchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape =\noutShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and ` +\n `${innerShapeB}) of Tensors with shapes\n${a.shape} and ` +\n `${b.shape} and transposeA=${transposeA}` +\n ` and transposeB=${transposeB}\nmust match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n[batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB,\ninnerShapeB] :\n [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the\nimplementation is designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs:\n{shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId\n= backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim\n= transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const\nbatchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim,\nrightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new\nUint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new\nInt32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n a3dId, aShapeBytes, a3d.shape.length, b3dId,\nbShapeBytes,\n b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\nbackend.disposeData(b3d.dataId);\n\n out.shape = outShape;\n return out;\n)\n\n\nexport const batchMatMulConfig:\nKernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:\nbatchMatMul as {} as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/BatchMatMul.js.map

```

No license file was found, but licenses were detected in source scan.

```

{"version":3,"file":"tf-backend-wasm.fesm.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernels/Identity.ts","../src/kernels/Transpose.ts","../src/kernels/kernel_utils.ts","../src/kernels/All.ts","../src/kernels/Any.ts","../src/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/kernels/Ceil.ts","../src/kernels/ClipByValue.ts","../src/kernels/Concat.ts","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/PreLU.ts","../src/kernels/Prod.ts","../src/kernels/Range.ts","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts

```

```

"/src/kernels/Reverse.ts","./src/kernels/RotateWithOffset.ts","./src/kernels/Round.ts","./src/kernels/Rsqrt.ts","./
src/kernels/ScatterNd.ts","./src/kernels/Select.ts","./src/kernels/Sigmoid.ts","./src/kernels/Sin.ts","./src/kernels/Sof
tmax.ts","./src/kernels/SpaceToBatchND.ts","./src/kernels/SplitV.ts","./src/kernels/Sqrt.ts","./src/kernels/Square.ts
","./src/kernels/SquaredDifference.ts","./src/kernels/Step.ts","./src/kernels/StridedSlice.ts","./src/kernels/Sub.ts",".
./src/kernels/Sum.ts","./src/kernels/Tan.ts","./src/kernels/Tanh.ts","./src/kernels/Tile.ts","./src/kernels/TopK.ts","./
src/kernels/Transform.ts","./src/kernels/Unpack.ts","./src/kernels/ZerosLike.ts","./src/register_all_kernels.ts","./sr
c/flags_wasm.ts","./wasm-out/tfjs-backend-wasm-threaded-simd.js","./wasm-out/tfjs-backend-wasm-threaded-
simd.worker.js","./wasm-out/tfjs-backend-
wasm.js","./src/backend_wasm.ts","./src/version.ts","./src/base.ts"],"sourcesContent":["/**\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { FusableActivation } from
'./types';\n\nlet wasmFusedMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, activation: number,\n biasId: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,\n null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number', // activation\n 'number', // biasId\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number' // out_id\n]);\n\nfunction fusedBatchMatMul(args: {\n inputs:
_FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend,\n attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !==
'float32') {\n throw new Error(\n ` _FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\nconst {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId =
backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if
(bias !== null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n ` _FusedMatMul only supports rank-1 bias but got ` +\n `rank
${biasData.shape.length}.`);\n }\n biasId = biasData.id;\n }\n const preluActivationWeightsId =
preluActivationWeights === null ?\n 0 : backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const
fusedActivation =\n FusableActivation[activation as { } as keyof typeof FusableActivation];\n if
(fusedActivation === null) {\n throw new Error(\n ` ${activation} activation not yet supported for
FusedConv2D ` +\n ` in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n

```

```

const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out =
backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new
Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n
wasmFusedMatMul(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n transposeA,
transposeB, fusedActivation, biasId, preluActivationWeightsId,\n leakyreluAlpha || 0, outId);\n\n return
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function
createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
// Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n
wasmFunc(xId, CppDType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
../unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport
function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?:
DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId:
number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /*

```

```

void *, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n}\n\nfunction kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}): \n TensorInfo {\n const {backend,\n inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId =\n backend.dataIdMap.get(b.dataId).id;\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape =\n backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape,\n outputType);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return\n out;\n }\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes =\n new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n // Currently only some float operations support full broadcast.\n if\n (supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n }\n const\n aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims =\n backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA &&\n loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting\n along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n return\n {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *

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*/\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *

http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

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/\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport\n {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet wasmFunc: (\n inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null / void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs:\n TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the

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\"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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=====\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backendtypedArrayFromHeap(x);\n const outVals = backendtypedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {identity} from './Identity';\nimport {CppType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */,\n [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args: {\n inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs\n }):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp = false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n if (permIsNoOp) {\n const cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n wasmTranspose(xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction removeOneSizeDims(\n shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n if (shape[i] !== 1) {\n newShape.push(shape[i]);\n }\n if (shape[perm[i]] !== 1) {\n newPerm.push(perm[i]);\n }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n let minValIdx = -1;\n for (let j = 0; j < newPerm.length; ++j) {\n if (newPerm[j] >= i && (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n minValIdx = j;\n }\n }\n newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright
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=====\n*\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(x: TensorInfo, axis: number|number[], backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n const newShape: number[] = new Array(xRank);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = xShape[permutedAxes[i]];\n }\n axes = backend_util.getInnerMostAxes(axes.length, xRank);\n xTransposed =\n transpose({inputs: [x], attrs: {permutedAxes}, backend});\n const xId = backend.dataIdMap.get(x.dataId).id;\n const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n if (transposedId !== xId) {\n inputWasTransposed = true;\n }\n }\n return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const [x] = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId, reduceSize, outId);\n }\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
governing permissions and\n \* limitations under the License.\n \*

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=====\n*\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any, null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { axis, keepDims } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n const { transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n \n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n \n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n \n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n \n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n \n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n \n return out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize: number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n]);\n}\n\nfunction argmax(\n args: { inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs }) {\n const { backend, inputs, attrs } = args;\n const { axis } = attrs as {} as ArgMaxAttrs;\n const { x } = inputs as {} as ArgMaxInputs;\n const xId =\n backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n const { transposed, axes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n \n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n }\n \n const outShape = input.shape.slice(0, -1);\n const out =\n backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize =\n util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n \n if (inputWasTransposed) {\n // dispose of the
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transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const
argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as { }
as KernelFunc,\n setupFunc: setup\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*/\n\nimport { AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmAvgPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n
'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n
'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n]);\n}\n\nfunction
avgPool(\n args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs,
backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n
`wasm backend does not support dataFormat: ` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n
}\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n `was backend
only supports average pooling with dilation = [1, 1], ` +\n `got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc\n};\n\n", "/*\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport { KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nexport function reshape(\n args: {inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} =
inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape =
util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () =>
`new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n `shape must have the same number of

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elements.});\n\n // Backend needs to track refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

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\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from\n './Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,\n null / void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number' // out_id\n]);\n\n function batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n }) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ?\n a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -\n 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input\n batch dimensions must either be the ` +\n `same or at least one input batch dimension must be 1. Got input ` +\n `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape =\n outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and ` +\n `${innerShapeB} of Tensors with shapes\n ${a.shape} and ` +\n `${b.shape} and transposeA=${transposeA}` +\n ` and transposeB=${transposeB}\n must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB,\n innerShapeB] :\n [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the\n implementation is designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs:\n {shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId =\n backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim =\n transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim,\n rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new\n Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new\n Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n a3dId, aShapeBytes, a3d.shape.length, b3dId,\n bShapeBytes,\n b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape = outShape;\n return out;\n }\n\n export const batchMatMulConfig:\n KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:

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batchMatMul as {} as KernelFunc\n};\n", "/\*\n \* @license\n \* Copyright 2020 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* \n \* http://www.apache.org/licenses/LICENSE-2.0\n \* \n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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*\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype, simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if (simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset = 0;\n inputs.forEach(input => {\n const size = util.sizeFromShape(input.shape);\n outVals.set(input.vals, offset);\n offset += size;\n });\n } else {\n let colOffset = 0;\n inputs.forEach(input => {\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(input.vals) :\n input.vals;\n let tIdx = 0;\n for (let row = 0; row < input.shape[0]; ++row) {\n const resIdx = row * outShape[1] + colOffset;\n for (let col = 0; col < input.shape[1]; ++col) {\n outVals[resIdx + col] = decodedData[tIdx++];\n }\n colOffset += input.shape[1];\n }\n })\n return outVals;\n }\n}\n\nsourceMappingURL=data:application/json;base64,eyJ2ZmZjaW9uIjozLCJmaWxlIjojQ29uY2F0X2ltcGwuanMiLCJzbnV3Y2VSb290Ijoiiwic291cmNlcyI6WyYuLi8uLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2t1bmQtY3B1L3NyYy9rZXJuZWxzL0NvbmlhbnR5Ij0sIm5hbWVzIjpbXSxibWVwcGluZ3MiOiJBQUFBQz7Ozs7Ozs7Ozs7Ozs7R0FIRzItBQUVILE9BQU8sRUFBRyYxZQUFZLEVBQXVDEIBQUksRUFBRyYxNQUNLHVCCQUF1QixDQUFDO0FBRTIGLE1BQU0sVUFBSxVQUFVLENBQ3RCLE1BQXFELEVBQUUsUUFBA0IsRUFDEkUsS0FBZSxvFQUFFLFBQXFCO0IBQ3hDLE1BQU0sT0FBTyxHQUFHLEIBQUksQ0FBQyxPqkFBaUIsQ0FBQyxLQUFLLQVLEVBQUUsSUFBSxvDQUFDLGFBBQWESQ0FBQyxRQUFRLENBQUMsQ0FBQyxvDQUFDO0IBRTVLEIBQUksWUFBWSxJQUFJLEtBQUssS0FBZSxvRQUFRLEVBQUU7UUFDEdEMsa0RBQWtEO1FBQ2xELEIBQUksTUFBTsxHQUFHLENBQUMsQ0FBQztRQUNmLE1BQU0sQ0FBQyxPQUFPLENBQUMsS0FBZSxvDQUFDLEVBQUU7WUFDckIsTUFBTsxJQUFJLEdBQUcsSUFBSxvDQUFDLGFBBQWESQ0FBQyxLQUFLLLENBQUMsS0FBZSxvDQUFDLENBQUM7WUFFNUMsT0FBc0IsQ0FBQyxHQUFHLENBQUMsS0FBZSxvDQUFDLEIBQWtCLEVBQUUsTUFBTsxvDQUFDLENBQUM7WUFDQUssTUFBTsxJQUFJLEIBQUksQ0FBQztRQUNqQixDQUFDLENBQUMsQ0FBQztLQUNKO1NBQU07UUFDTcXJQUFJLFBQVMsR0FBRYxDQUFDLENBQUM7UUFFbEIsTUFBTsxvDQUFDLE9BQU8sQ0FBQyxLQUFLLLENBQUMsRUFBRtZQUYQixNQUNLFBQVcsR0FBRYxLQUFLLLEtBQUssUUFBUSxvDQUFDLENBQUM7Z0JBQ3BDLFIBQVksQ0FBQyxzQkFBc0IsQ0FBQyxLQUFLLLENBQUMsSUFBB0IsQ0FBQyxvDQUFDLENBQUM7Z0JBQ2pFLEtBQUssQ0FBQyxJQUFRQixDQUFDO1IBRTdCLEIBQUksSUFBSxvHQUFHLENBQUMsQ0FBQztZQUVILEtBQUssSUFBSxvHQUFHLEdBQUcsQ0FBQyxvFQUFFLEdBQUcsR0FBRYxLQUFLLLENBQUMsS0FBZSxvDQUFDLENBQUMsQ0FBQyxvFQUFFLEVBQUUsR0FBRYxvFQUFFO2dCQUM3QyxNQUNLE1BQU0sR0FBRYxHQUFHLEdBQUcsUUFBUSxvDQUFDLENBQUMsQ0FBQyxvHQUFHLENBQVMsQ0FBQztnQkFDN0MsS0FBZSxvJQUFJLEdBQUcsR0FBRYxDQUFDLEVBQUUsR0FBRYxvHQUFHLEtBQUssQ0FBQyxLQUFLLLENBQUMsQ0FBQyxvDQUFDLEVBQUUsRUFBRsxHQUFHLEVBQUU7b0JBQzdDLE9BQU8sQ0FBQyxNQUNLEdBQUcsR0FBRYxDQUFDLEdBQUcsV0FBVyxvDQUFDLEIBQUksRUFBRsxvDQUFDLENBQUM7aUJBQzdDO2FBQ0Y7WUFFRCxTQUFTLEIBQUksS0FBZSxvDQUFDLEtBQUssQ0FBQyxvDQUFDLENBQUMsQ0FBQztRQUM5QixDQUFDLENBQUMsQ0FBQztLQUNKO0IBRUQsT0FBTyxPQUFPLENBQUM7QUFDakIsQ0FBQyIsInNvdXJjZXNDb250ZW50IjpbIi8qKlxlUCogQGxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEIEdvb2dsZSBMTEMuIEIEFsbCBSaWdodHMgUmVzZXJ2ZWQuXG4gKiBMaWNIbnNIZCB1bmRlciB0aGUgQXBhY2hlIEpY2Vuc2UsIFZlcnNpb24gMi4wICh0aGUgXCJMaWNIbnNIXCIpO1xlUCogeW91IG1heSBub3QgdXNlIHRoaXMgZmlsZSBleGNlcHQgaW4gY29tcGxpYW5jZSB3aXR0IHRoZSBMaWNIbnNlILxlUCogWW91IG1heSBvYnRhaW4gYSBjb3B5IG9mIHRoZSBMaWNIbnNlIGF0XG4gKlxlUCogaHR0cDovL3d3dy5hcGFjaGUub3JnL2xpY2Vuc2VzL0xvJQ0VOU0UtMi4wXG4gKlxlUCogVW5sZXNzIHJlcXVpcmVkiGJ5I
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YWx1ZXNbaV0gPSB2YWx1ZXNbaSAtIDFdfICsgc3RlcDtcbiAgfVxuIcogIENvcHlyaWdodCAyMDIwIEdvb2dsZSBMT  
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=====  
\n \*\nimport { backend\_util, buffer, Slice, slice\_util, util } from '@tensorflow/tfjs-core';\nimport { assertNotComplex







0gYXR0cnM7XG5cbiAgYXNzZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcb1xuICBjb25zdCBbJGJlZ2luLCAk  
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TogJ2NwdScsXG4gIGtcm5lbeZ1bmM6IHNsaWNlIGFzIHt9IGFzIEtcm5lbeZ1bmNcbn07XG4iXX0=","/\*\n \*  
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the specific language governing permissions and\n \* limitations under the License.\n \*

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=====\n\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util }
from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { sliceImplCPU } from
 './kernel_utils/shared';\n\nexport function slice(\n args: { inputs: SliceInputs, attrs: SliceAttrs, backend:
BackendWasm }) {\n const { inputs: { x }, attrs: { begin, size }, backend } = args;\n\n const [begin_, size_] =
slice_util.parseSliceParams(x, begin, size);\n\n const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,
size_);\n\n const xVals = backend.readSync(x.dataId);\n\n const out = backend.makeOutput(size_, x.dtype);\n\n const xStrides = util.computeStrides(x.shape);\n\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinuous) {\n const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n if (x.dtype === 'string') {\n outData.stringBytes =\n (xVals as Uint8Array[]).slice(flatOffset, flatOffset +
util.sizeFromShape(size_));\n } else {\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(\n (xVals as TypedArray).subarray(flatOffset, flatOffset +
util.sizeFromShape(size_));\n);\n }\n\n return out;\n }\n\n if (x.dtype === 'string') {\n const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n outData.stringBytes = res as Uint8Array[];\n return
out;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n\n const rank = x.shape.length;\n\n if (rank === 2) {\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as [number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4) {\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number, number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return
out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:
backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI; i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:
[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
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const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK
+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)
{\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }
 }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport
{ reshape } from './Reshape';\n\nimport { slice } from './Slice';\n\nimport { transpose } from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,
crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped =
backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n const result = slice({\n inputs: {x: xTransposedReshaped},\n backend,\n
attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n
backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return
result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\n\nimport
{ TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nexport function
cast(\n args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm};\n TensorInfo {\n const {inputs:
{x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals =
backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n
return out;\n }\n)\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as {} as KernelFunc,\n};\n", "/*\n * @license\n *
Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

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software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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=====\n *\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n *\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', // max\n 'number' // out_id\n]);\n function clip(args: {\n inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n }) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n }\n export const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as KernelFunc\n };}\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n *\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {concatImplCPU} from './kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\nexport function concat(\n args: {\n inputs: ConcatInputs,\n backend: BackendWasm,\n attrs: ConcatAttrs\n }) {\n const {inputs, backend} = args;\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length === 1) {\n return identity({inputs: {x: $inputs[0]}, backend});\n }\n const out = backend.makeOutput(outShape, inputs[0].dtype);\n if (util.sizeFromShape(outShape) === 0) {\n return out;\n }\n const shapes = $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n if ($inputs[0].dtype === 'string') {\n // Any concat of n-dimensional tensors across any axis can be reduced to\n // a concatenation of two-dimensional tensors across the axis 1 by first\n // partitioning the axes of the original tensors into those less than\n // axis to be concatenated and the rest. Then reshape the tensors\n // into a two-dimensional tensor by collapsing these two sets of axes and\n // concatenate the resulting matrices across the axis 1, finally reshaping\n // the result to have the proper shape.\n const inputs2D = $inputs.map(t => {\n const innerSize = util.sizeFromShape(t.shape.slice(axis));\n const shape = [-1, innerSize];\n return reshape({inputs: {x: t}, backend, attrs: {shape}});\n });\n const inputsValShapes = inputs2D.map(t => {\n return {vals:
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backend.readSync(t.dataId), shape: t.shape};\n });\n\n // Concat 2d tensors along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat =\n inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n inputsValShapes, outShape,\n inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const\n outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes =\n backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n };\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims =\n 0;\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input =>\n backend.typeArrayFromHeap(input));\n const outVals = backend.typeArrayFromHeap(out);\n for (let b = 0; b <\n batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const\n innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset,\n inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return\n out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n *=====\n\n *\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmConv2d: (\n xId:\n number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number,\n filterWidth: number, padTop: number, padRight: number, padBottom: number, padLeft: number, isSamePad:\n number,\n dilationHeight: number, dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend:\n BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend:\n BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat =\n backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false,\n $dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const\n padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom =\n convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =\n convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =\n convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =\n convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type\n === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend\n Conv2D does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n}\n\n

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const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
xRowStride: number, xColStride: number, xChannelStride: number,\n yBatchStride: number, yRowStride:
number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n
'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n
'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n
'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n
'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n
'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n
'number', // yChannelStride\n 'number', // outId\n]);\n\nfunction conv2DBackpropInput(args: {\n backend:
BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const { backend, inputs, attrs } = args;\n const { dy, filter } = inputs;\n const { strides, pad, dataFormat,
dimRoundingMode, inputShape } = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n
inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n
inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2,

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xBatchStride, xRowStride,\n xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:\n conv2DBackpropInput as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an\n \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n =====\n\n *\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * \n * \n http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an\n \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either\n express or implied.\n * See the License for the specific language governing\n permissions and\n * limitations under the License.\n *\n =====\n\n *\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a\n copy of the License at\n * \n * \n http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an\n \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either\n express or implied.\n * See the License for the specific language governing\n permissions and\n * limitations under the License.\n *\n =====\n\n *\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,\n TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast\n from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest\n = 1\n}\n\nlet wasmCropAndResize: (\n imagesId: number, boxesId: number, boxIndId: number, numBoxes:\n number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number,\n extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n 'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n 'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n 'number'\n // out id\n]);\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { method,\n extrapolationValue, cropSize } = attrs;\n const { image, boxes, boxInd } = inputs;\n const numBoxes =\n boxes.shape[0];\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =\n [numBoxes, cropHeight, cropWidth, image.shape[3]];\n let imagesData =\n backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData =\n cast({ backend, inputs: { x: image },\n attrs: { dtype: 'float32' }});\n imagesData =\n backend.dataIdMap.get(castedData.dataId);\n }\n const imagesId = imagesData.id;\n const boxesId =\n backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId =\n backend.dataIdMap.get(boxInd.dataId).id;\n const\n out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const

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imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n
imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n
InterpolationMethod[method as { } as keyof typeof InterpolationMethod],\n extrapolationValue, outId);\n\n if
(castedData != null) {\n backend.disposeData(castedData.dataId);\n } }\n\n return out;\n}\n\nexport const
cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: cropAndResize as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util }
from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from
 './types';\n\nimport { transpose } from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n 'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n 'number' //
dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs});\n\nTensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis,
exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis
to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n permutedOutId, CppDType[x.dtype]);\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n }\n backend.disposeData(permutedOut.dataId);\n }\n\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as { } as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction

```



```

setup(backend: BackendWasm): void {
 wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [number, // xId number, // blockSize number, // channelsLast array, // xStrides
number, // xStridesLength array, // outputShape array, // outputStrides number, // outSize
number, // outId]);
}
export function depthToSpace(args: {
 backend: BackendWasm,
 inputs: DepthToSpaceInputs,
 attrs: DepthToSpaceAttrs
}): TensorInfo {
 const {backend, inputs, attrs} = args;
 const {x} = inputs;
 const {blockSize, dataFormat} = attrs;
 const batchSize = x.shape[0];
 const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];
 const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];
 const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];
 const outputHeight = inputHeight * blockSize;
 const outputWidth = inputWidth * blockSize;
 const outputDepth = inputDepth / (blockSize * blockSize);
 const outputShape = (dataFormat === 'NHWC') ? [batchSize, outputHeight, outputWidth, outputDepth] : [batchSize, outputDepth, outputHeight, outputWidth];
 const out = backend.makeOutput(outputShape, 'float32');
 const xData = backend.dataIdMap.get(x.dataId);
 const xId = xData.id;
 const xStridesBytes = new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);
 const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);
 const outStridesBytes = new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);
 const outId = backend.dataIdMap.get(out.dataId).id;
 const channelsLast = dataFormat === 'NHWC' ? 1 : 0;
 wasmDepthToSpace(xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1, outputShapeBytes, outStridesBytes, outputShape.length, outId);
 return out;
}
export const depthToSpaceConfig: KernelConfig = {
 kernelName: DepthToSpace,
 backendName: 'wasm',
 setupFunc: setup,
 kernelFunc: depthToSpace as {} as KernelFunc
};
}

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See the License for the specific language governing permissions and limitations under the License.

=====
import {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
let wasmDepthwiseConv2d: (xId: number, batchSize: number, inputHeight: number, inputWidth: number, filterId: number, filterHeight: number, filterWidth: number, padTop: number, padRight: number, padBottom: number, padLeft: number, isSamePad: number, dilationHeight: number, dilationWidth: number, strideHeight: number, strideWidth: number, inputChannels: number, outputChannels: number, outId: number) => void;
function setup(backend: BackendWasm) {
 wasmDepthwiseConv2d = backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [number, // xId number, // batchSize number, // inputHeight number, // inputWidth number, // filterId number, // filterHeight number, // filterWidth number, // padTop number, // padRight number, // padBottom number, // padLeft number, // isSamePad number, // dilationHeight number, // dilationWidth number, // strideHeight number, // strideWidth number, // inputChannels number, // outputChannels number, // outId]);
}
function depthwiseConv2d(args: {
 inputs: DepthwiseConv2dNativeInputs,
 backend: BackendWasm,
 attrs: DepthwiseConv2dNativeAttrs
}) {
 const {inputs, attrs, backend} = args;
 const {x, filter} = inputs;
 const xId = backend.dataIdMap.get(x.dataId).id;
 const filterId = backend.dataIdMap.get(filter.dataId).id;
 const {strides, dilations, pad, dimRoundingMode} = attrs;
 const $dilations = dilations === null ? [1, 1] : dilations;
 const convInfo = backend_util.computeConv2DInfo(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, ($dilations as number | [number, number]), pad, dimRoundingMode, true /* depthwise */);
 const filterHeight = convInfo.filterHeight;
 const filterWidth = convInfo.filterWidth;
 const padTop = convInfo.padInfo.top;
 const padRight = convInfo.padInfo.right;
 const padBottom = convInfo.padInfo.bottom;
}

```

```

const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative
does not support dataFormat:` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n outputChannels, outId);\n return out;\n);\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from

```

```

'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from
'./Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} =
attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if
(dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n inputRank}]\`);\n $dim = inputRank + dim
+ 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape:
newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nexport function fill(args: {attrs:
FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out =
backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as
number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName:
'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch:
number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', //
imageWidth\n 'number', // numChannels\n 'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n
const {image} = inputs;\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId =
backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch,
imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as
KernelFunc,\n setupFunc: setup\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====
*\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n", "/*\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====
*\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet
wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number,
varianceEpsilon: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number',
'number', 'number', 'number', 'number', 'number']);\n}\nfunction fusedBatchNorm(args: {\n backend:
BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =
inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =
backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n return out;\n}\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:
FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport
{FusableActivation} from './types';\nlet wasmFusedConv2d: (\n xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number,

```

```

padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number,\n dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number,\n leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n\n function fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n }) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n ` ${activation} activation not yet supported for FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =\n backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support dataFormat: ` +\n `${dataFormat}`. Please use 'NHWC'.);\n }\n\n const out =\n backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n }\n\n export const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n };
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\n =====\n

```

```

*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight:
number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
 void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n
'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n\n function
fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:
FusedDepthwiseConv2DAttrs\n }) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias,
preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
 dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
 pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {}
as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `_${activation}_
activation not yet supported for FusedDepthwiseConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const
outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
 `FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n
 `FusedDepthwiseConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels}).`);\n }\n\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
 fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n }\n\n export const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n };}\n\n"/**\n * @license\n
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"License");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \*\n \* http://www.apache.org/licenses/LICENSE-2.0\n \*\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an "AS IS" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet\nwasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from './Reshape';\nimport {CppType} from './types';\n\nlet\nwasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:
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{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape =
[\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n }\n\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig }
from '/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from
'/types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
out_id\n]);\n\n\nexport function leakyRelu(\n args:\n {inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm});\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either

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float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape) != 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha, outId);\n }\n\n return out;\n}\n\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n\n*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n\n",/**\n * @license\n * Copyright 2019 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n\n",/**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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```
=====\n\n*\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n\n",/**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmMax: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n
'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction max(args: {backend:
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId =
transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the
transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const maximumConfig: KernelConfig =\n
createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', //
inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', //

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padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number',
// inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat:` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n
backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n
cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId =

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backend.dataIdMap.get(castedInput.dataId).id;\n } \n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) != 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMean(inputId, reduceSize, outId);\n } \n\n if (inputWasTransposed) {\n // dispose of the transposed
tensor.\n backend.disposeData(transposed.dataId);\n } \n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n } \n\n if (input.dtype
!= 'float32') {\n backend.disposeData(castedInput.dataId);\n } \n\n return out;\n } \n\nexport const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as { }
as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport { backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n 'number', // x_id\n
'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction min(args: { backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n
const { axis, keepDims } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let
inputId = xId;\n let input = x;\n const { transposed, axes, originalAxes, inputWasTransposed } =\n
permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId != xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n
}\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape,
axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n const out = backend.makeOutput(outShape,
input.dtype);\n if (util.sizeFromShape(input.shape) != 0) {\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n } \n\n if
(inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n
}\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);\n out.shape = newShape;\n } \n\n return out;\n } \n\nexport const minConfig: KernelConfig = {\n
kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport { KernelConfig, Minimum } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2021 Google
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\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction\n setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null / void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n]);\n\n function\n mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n }) {\n const\n {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map((p, i) => p[0] /*\n beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const\n xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const\n postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes,\n MirrorPaddingMode[mode], outId);\n return out;\n }\n\n export const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc: setup\n };\n\n /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n */\n }\n\n export const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc: setup\n };\n\n /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n */\n}
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*\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n */
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*\n\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
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=====\n*\n\nimport { BackendWasm } from './backend_wasm';\n\n// Analogous to `struct Result` in\n`non_max_suppression_impl.h`\n\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the\n * shape equivalent to\n * `Result`\n */\n\nexport function parseResultStruct(\n backend: BackendWasm, resOffset:\n number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const\n pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const\n pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores,\n pValidOutputs};\n}\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n * the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n\n
```

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=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,\n NonMaxSuppressionV3Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from\n './backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)\n=> number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n]);\n\n function kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs:\n NonMaxSuppressionV3Attrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold,\n maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =\n backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const\n resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const\n {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor\n =\n backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n\n return\n selectedIndicesTensor;\n }\n\n export const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:\n NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {\n } as\n KernelFunc,\n }; \n}\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n\n
```

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=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,\n NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
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'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n\n function nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n const { backend, inputs, attrs } = args;\n const { iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize } =\n attrs;\n const { boxes, scores } = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the
heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor =
 backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor,
validOutputsTensor];\n\n }\n\n export const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n }; \n", /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'number', // softNmsSigma\n]);\n\n function kernelFunc(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[]
{\n const { backend, inputs, attrs } = args;\n const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma }
=\n attrs;\n const { boxes, scores } = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const { pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs } =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const
selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const
selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return
[selectedIndicesTensor, selectedScoresTensor];\n\n }\n\n export const nonMaxSuppressionV5Config: KernelConfig =
{\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc
as { } as KernelFunc,\n }; \n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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limitations under the License.

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* \nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
* \nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue: number, offValue: number,\n outId: number) => void;\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n}\nfunction oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n}\nreturn out;\n}\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as\n {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
* \nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.tensorArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as\n {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
* \nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
```



```

core';\nimport {BackendWasm} from './backend_wasm';\n\nimport {concat} from './Concat';\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend:
BackendWasm, attrs: PackAttrs});\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} =
attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n util.assert(\n dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const
expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n }\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc;\n};\n\n"/**\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType}
from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n
]);\n\nfunction pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-
circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const
xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const
outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new
Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as
KernelFunc,\n setupFunc: setup;\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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```

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*\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\ncreateBinaryKernelConfig(Pow, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' //
out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend}
= args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if
(input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype
!== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig:
KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as
KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs:
ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}
= inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const
{transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize
= util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of

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the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const\n newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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\n\n *\n\nimport { KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo } from '@tensorflow/tfjs-core';\nimport\n{ BackendWasm } from '../backend_wasm';\nimport { rangeImplCPU } from '../kernel_utils/shared';\n\nexport const\nrange =\n (args: { backend: BackendWasm, attrs: RangeAttrs }): TensorInfo => {\n const { backend, attrs } =\n args;\n const { start, stop, step, dtype } = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n const out = backend.makeOutput([values.length], dtype);\n const outVals =\n backend.typedArrayFromHeap(out);\n outVals.set(values);\n return out;\n };\n\nexport const rangeConfig:\nKernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as { } as\n KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n limitations under the\n License.\n *
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\n\n *\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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\n\n *\n\nimport { KernelConfig, Relu } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n'/unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n limitations under the License.\n *
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```
\n\n *\n\nimport { KernelConfig, Relu6 } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n'/unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
```

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*
\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', // oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n\n function resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData = cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmResizeBilinear(xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth, alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n if (castedData !== null) {\n backend.disposeData(castedData.dataId);\n }\n return out;\n }\n\n export const resizeBilinearConfig: KernelConfig = {\n kernelName: 'ResizeBilinear',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n };
}";
/*
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 * you may not use this file except in compliance with the License.
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 * software distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
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\n
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*
\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n 'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n 'number' // out_id\n]);\n\n export function reverse(args: {\n inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs\n }): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n const axes = util.parseAxisParam(dims, x.shape);\n if (x.shape.length === 0) {\n return identity({inputs: {x}, backend});\n }\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n wasmReverse(xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n const reshaped = reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n }\n}
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backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc:\n setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n\nimport { KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,\n TensorInfo } from '@tensorflow/tfjs-core';\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport\n { BackendWasm } from '../backend_wasm';\n\nlet wasmRotate: (\n xId: number, batch: number, imageHeight:\n number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n]);\n\n export function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n }): TensorInfo {\n const { inputs, backend, attrs } =\n args;\n const { image } = inputs;\n const { radians, fillValue, center } = attrs;\n\n const out =\n backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] =\n image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight,\n imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n const fillValues =\n typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY,\n fillBytes, fillValues.length, outId);\n return out;\n }\n\n export const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n\nimport { KernelConfig, Round } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\nimport { KernelConfig, Rsqrt } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
```

```

'/unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util }
from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from
'/types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', //
sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n
'number' // outId\n]);\n\n function scatterNd(\n args: {\n backend: BackendWasm, inputs:
ScatterNdInputs, attrs: ScatterNdAttrs);\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { indices,
updates } = inputs;\n const { shape } = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if
(util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const { sliceRank, numUpdates, sliceSize, strides,
outputSize } =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData =
backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize,
stridesBytes, outputSize, outId);\n\n return out;\n }\n\n export const scatterNdConfig: KernelConfig = {\n
kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as {} as
KernelFunc\n };\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { KernelConfig, KernelFunc, Select, SelectInputs, util } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number, eId: number,
offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n
'number', // offset\n 'number', // outId\n]);\n\n function select(args: { inputs: SelectInputs, backend:
BackendWasm }) {\n const { inputs, backend } = args;\n const { condition, t, e } = inputs;\n\n const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 : \n
util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n }\n\n export
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {}
as KernelFunc,\n setupFunc: setup\n };\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
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```
=====\n*\n\nimport { KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>\nvoid;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /*\nvoid */, ['number', 'number']);\n}\n\nfunction sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\nTensorInfo {\n const { backend, inputs: { x } } = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as { } as KernelFunc\n};\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) =>\nvoid;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n 'number', // channels\n 'number' // batch\n]);\n}\n\nfunction softmax(\n args: { backend: BackendWasm, inputs: SoftmaxInputs, attrs: SoftmaxAttrs }):\nTensorInfo {\n const { backend, inputs: { logits }, attrs: { dim } } =\nargs;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as { } as KernelFunc\n};\n\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { padV2Config } from './PadV2';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { blockShape, paddings } = attrs;\n const prod = util.sizeFromShape(blockShape);\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n const paddedX = padV2Config.kernelFunc({\n inputs: { x },\n backend,\n attrs: { paddings: completePaddings, constantValue: 0 }\n }) as TensorInfo;\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n const reshapeInputs: ReshapeInputs = { x: paddedX };\n const reshapeAttrs: ReshapeAttrs = { shape: reshapedPaddedShape };\n const paddedXReshaped =\n reshape({ inputs: reshapeInputs, backend, attrs: reshapeAttrs });\n const transposeInputs: TransposeInputs = { x: paddedXReshaped };\n const transposeAttrs: TransposeAttrs = { perm: permutedReshapedPaddedPermutation };\n const paddedXT =\n transpose({ inputs: transposeInputs, backend, attrs: transposeAttrs });\n const resultReshapeInputs: ReshapeInputs = { x: paddedXT };\n const resultReshapeAttrs: ReshapeAttrs = { shape: flattenShape };\n const result = reshape(\n { inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs });\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the\n * specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util } from '@tensorflow/tfjs-core';\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { slice } from './Slice';\n\nexport function splitV(\n args: {\n inputs: SplitVInputs,\n attrs: SplitVAttrs,\n backend: BackendWasm\n}) {\n const { inputs, attrs, backend } = args;\n const { x } = inputs;\n const { numOrSizeSplits, axis } = attrs;\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n const xSliceSize = [...size];\n xSliceSize[$axis] = s;\n const xSlice =\n slice({ inputs: { x }, attrs: { begin, size: xSliceSize }, backend });\n begin[$axis] += s;\n return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the\n * specific language
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=====
*\n\nimport { KernelConfig, Sqrt } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n\n", "/*\n * @license\n
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the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { KernelConfig, Square } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n\n", "/*\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { KernelConfig, SquaredDifference } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig }
from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const squaredDifferenceConfig: KernelConfig
=\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n\n", "/*\n * @license\n * Copyright
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport { KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n
'number', // alpha\n 'number', // dtype\n 'number', // out_id\n]);\n\n function step(\n args: { backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n
const { alpha } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const out =
backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmStep(xId,
alpha, CppDType[x.dtype], outId);\n return out;\n }\n\n export const stepConfig: KernelConfig = {\n kernelName:
Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n };
\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the 'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,

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util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array,\n xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction\nsetup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', //\n outShapeLength\n 'number', // outId\n]);\n\n export function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n }): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { x } = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x},\n backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is\n memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have\n rank at least 1, got: ${x.shape.length}`);\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x},\n backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape:\n finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out =\n backend.makeOutput(finalShapeSparse, 'float32');\n const xId = backend.dataIdMap.get(x.dataId).id;\n const\n xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes\n = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new\n Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n const\n outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes =\n new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length,\n beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n backend.disposeData(out.dataId);\n }\n\n return result;\n }\n\n export const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n };}\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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=====\n
\nimport { KernelConfig, Sub } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n\n/\n * @license\n * Copyright 2019 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
=====\n

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*\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n 'number', // input_id\n
'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}): TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let
inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was
not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =
transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length,
input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'sum', reductionAxes,
input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of
the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n
const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/*\n * @license\n *
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License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n

```

```

*\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTile: (\n xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', //
x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n
]);\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs,
backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} =
attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out =
backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: tile as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number',
// x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n
'number', // outIndicesId\n]);\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n
const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n const outIndices =
backend.makeOutput(outputShape, 'int32');\n const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length,
CppType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: topk as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmTransform: (\n imageId:

```

```

number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth:
number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n stridesLength: number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform,
null /*void*/, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n 'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n 'number', //
imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n 'number', //
interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number' // outId\n
]);\n\nfunction transform(\n args:\n {backend: BackendWasm, inputs: TransformInputs, attrs:
TransformAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n const [batch, imageHeight, imageWidth,
numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape :
[imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as
[number, number, number, number];\n const strides =\n new Uint8Array(new
Int32Array(util.computeStrides(image.shape)).buffer);\n const out = backend.makeOutput(outShape,
image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const imageData =
backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n const transformsData =
backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n const
interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case
'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n
fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n
break;\n }\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n
outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId,
fillModeId, fillValue,\n outId);\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n
kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from
'./Slice';\n\nfunction unpack(\n args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs}):\n
TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n if (axis <
0) {\n axis += value.shape.length;\n }\n const numOutputs = value.shape[axis];\n const rank =
value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank;\n i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new
Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size},
backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const
unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

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on an "AS IS" BASIS, \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \* See the License for the specific language governing permissions and \* limitations under the License.

```
=====
*\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport\n{BackendWasm} from './backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:\nBackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const\nzerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike\nas { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n
```

```
===== \n *\n//
```

We explicitly import the modular kernels so they get registered in the global registry when we compile the library. A modular build would replace the contents of this file and import only the kernels that are needed.

```
\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig}\nfrom './kernels/_FusedMatMul';\n\nimport {absConfig} from './kernels/Abs';\n\nimport {addConfig} from\n './kernels/Add';\n\nimport {addNConfig} from './kernels/AddN';\n\nimport {allConfig} from './kernels/All';\n\nimport\n{anyConfig} from './kernels/Any';\n\nimport {argMaxConfig} from './kernels/ArgMax';\n\nimport {avgPoolConfig}\nfrom './kernels/AvgPool';\n\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\n\nimport\n{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\n\nimport {castConfig} from './kernels/Cast';\n\nimport\n{ceilConfig} from './kernels/Ceil';\n\nimport {clipByValueConfig} from './kernels/ClipByValue';\n\nimport\n{concatConfig} from './kernels/Concat';\n\nimport {conv2DConfig} from './kernels/Conv2D';\n\nimport\n{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\n\nimport {cosConfig} from\n './kernels/Cos';\n\nimport {coshConfig} from './kernels/Cosh';\n\nimport {cropAndResizeConfig} from\n './kernels/CropAndResize';\n\nimport {cumsumConfig} from './kernels/Cumsum';\n\nimport {depthToSpaceConfig}\nfrom './kernels/DepthToSpace';\n\nimport {depthwiseConv2dNativeConfig} from\n './kernels/DepthwiseConv2dNative';\n\nimport {eluConfig} from './kernels/Elu';\n\nimport {equalConfig} from\n './kernels/Equal';\n\nimport {expConfig} from './kernels/Exp';\n\nimport {expandDimsConfig} from\n './kernels/ExpandDims';\n\nimport {fillConfig} from './kernels/Fill';\n\nimport {flipLeftRightConfig} from\n './kernels/FlipLeftRight';\n\nimport {floorConfig} from './kernels/Floor';\n\nimport {floorDivConfig} from\n './kernels/FloorDiv';\n\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\n\nimport\n{fusedConv2DConfig} from './kernels/FusedConv2D';\n\nimport {fusedDepthwiseConv2DConfig} from\n './kernels/FusedDepthwiseConv2D';\n\nimport {gatherNdConfig} from './kernels/GatherNd';\n\nimport\n{gatherV2Config} from './kernels/GatherV2';\n\nimport {greaterConfig} from './kernels/Greater';\n\nimport\n{greaterEqualConfig} from './kernels/GreaterEqual';\n\nimport {identityConfig} from './kernels/Identity';\n\nimport\n{leakyReluConfig} from './kernels/LeakyRelu';\n\nimport {lessConfig} from './kernels/Less';\n\nimport\n{lessEqualConfig} from './kernels/LessEqual';\n\nimport {logConfig} from './kernels/Log';\n\nimport\n{logicalAndConfig} from './kernels/LogicalAnd';\n\nimport {maxConfig} from './kernels/Max';\n\nimport\n{maximumConfig} from './kernels/Maximum';\n\nimport {maxPoolConfig} from './kernels/MaxPool';\n\nimport\n{meanConfig} from './kernels/Mean';\n\nimport {minConfig} from './kernels/Min';\n\nimport {minimumConfig} from\n './kernels/Minimum';\n\nimport {mirrorPadConfig} from './kernels/MirrorPad';\n\nimport {multiplyConfig} from\n './kernels/Multiply';\n\nimport {negConfig} from './kernels/Neg';\n\nimport {nonMaxSuppressionV3Config} from\n './kernels/NonMaxSuppressionV3';\n\nimport {nonMaxSuppressionV4Config} from
```

```

./kernels/NonMaxSuppressionV4';\nimport { nonMaxSuppressionV5Config } from
./kernels/NonMaxSuppressionV5';\nimport { notEqualConfig } from './kernels/NotEqual';\nimport { oneHotConfig }
from './kernels/OneHot';\nimport { onesLikeConfig } from './kernels/OnesLike';\nimport { packConfig } from
./kernels/Pack';\nimport { padV2Config } from './kernels/PadV2';\nimport { powConfig } from
./kernels/Pow';\nimport { preluConfig } from './kernels/Prelu';\nimport { prodConfig } from './kernels/Prod';\nimport
{ rangeConfig } from './kernels/Range';\nimport { realDivConfig } from './kernels/RealDiv';\nimport { reluConfig }
from './kernels/Relu';\nimport { relu6Config } from './kernels/Relu6';\nimport { reshapeConfig } from
./kernels/Reshape';\nimport { resizeBilinearConfig } from './kernels/ResizeBilinear';\nimport { reverseConfig } from
./kernels/Reverse';\nimport { rotateWithOffsetConfig } from './kernels/RotateWithOffset';\nimport { roundConfig }
from './kernels/Round';\nimport { rsqrtConfig } from './kernels/Rsqrt';\nimport { scatterNdConfig } from
./kernels/ScatterNd';\nimport { selectConfig } from './kernels/Select';\nimport { sigmoidConfig } from
./kernels/Sigmoid';\nimport { sinConfig } from './kernels/Sin';\nimport { sliceConfig } from './kernels/Slice';\nimport
{ softmaxConfig } from './kernels/Softmax';\nimport { spaceToBatchNDConfig } from
./kernels/SpaceToBatchND';\nimport { splitVConfig } from './kernels/SplitV';\nimport { sqrtConfig } from
./kernels/Sqrt';\nimport { squareConfig } from './kernels/Square';\nimport { squaredDifferenceConfig } from
./kernels/SquaredDifference';\nimport { stepConfig } from './kernels/Step';\nimport { stridedSliceConfig } from
./kernels/StridedSlice';\nimport { subConfig } from './kernels/Sub';\nimport { sumConfig } from
./kernels/Sum';\nimport { tanConfig } from './kernels/Tan';\nimport { tanhConfig } from './kernels/Tanh';\nimport
{ tileConfig } from './kernels/Tile';\nimport { topKConfig } from './kernels/TopK';\nimport { transformConfig } from
./kernels/Transform';\nimport { transposeConfig } from './kernels/Transpose';\nimport { unpackConfig } from
./kernels/Unpack';\nimport { zerosLikeConfig } from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n \n absConfig,\n \n addConfig,\n \n addNConfig,\n \n allConfig,\n \n anyConfig,\n \n
argMaxConfig,\n \n avgPoolConfig,\n \n batchMatMulConfig,\n \n batchToSpaceNDConfig,\n \n castConfig,\n \n
ceilConfig,\n \n clipByValueConfig,\n \n concatConfig,\n \n conv2DConfig,\n \n conv2DBackpropInputConfig,\n \n
cosConfig,\n \n coshConfig,\n \n cropAndResizeConfig,\n \n cumsumConfig,\n \n depthToSpaceConfig,\n \n
depthwiseConv2dNativeConfig,\n \n eluConfig,\n \n equalConfig,\n \n expConfig,\n \n expandDimsConfig,\n \n fillConfig,\n
 \n flipLeftRightConfig,\n \n floorConfig,\n \n floorDivConfig,\n \n fusedMatMulConfig,\n \n fusedBatchNormConfig,\n
 \n fusedConv2DConfig,\n \n fusedDepthwiseConv2DConfig,\n \n gatherNdConfig,\n \n gatherV2Config,\n \n greaterConfig,\n
 \n greaterEqualConfig,\n \n identityConfig,\n \n leakyReluConfig,\n \n lessConfig,\n \n lessEqualConfig,\n \n logConfig,\n
 \n logicalAndConfig,\n \n maxConfig,\n \n maximumConfig,\n \n maxPoolConfig,\n \n meanConfig,\n \n minConfig,\n
 \n minimumConfig,\n \n mirrorPadConfig,\n \n multiplyConfig,\n \n negConfig,\n \n nonMaxSuppressionV3Config,\n \n
nonMaxSuppressionV4Config,\n \n nonMaxSuppressionV5Config,\n \n notEqualConfig,\n \n oneHotConfig,\n \n
onesLikeConfig,\n \n packConfig,\n \n padV2Config,\n \n powConfig,\n \n preluConfig,\n \n prodConfig,\n \n rangeConfig,\n
 \n realDivConfig,\n \n reluConfig,\n \n relu6Config,\n \n reshapeConfig,\n \n resizeBilinearConfig,\n \n reverseConfig,\n
 \n rotateWithOffsetConfig,\n \n rsqrtConfig,\n \n roundConfig,\n \n scatterNdConfig,\n \n selectConfig,\n \n sigmoidConfig,\n
 \n sinConfig,\n \n sliceConfig,\n \n softmaxConfig,\n \n spaceToBatchNDConfig,\n \n splitVConfig,\n \n sqrtConfig,\n
 \n squareConfig,\n \n squaredDifferenceConfig,\n \n stepConfig,\n \n stridedSliceConfig,\n \n subConfig,\n \n sumConfig,\n
 \n tanConfig,\n \n tanhConfig,\n \n tileConfig,\n \n topKConfig,\n \n transformConfig,\n \n transposeConfig,\n \n
unpackConfig,\n \n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n \n registerKernel(kernelConfig);\n}\n\n"/**\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */\n\n
=====\n
*\nimport { env } from './tensorflow/tfjs-core';\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array

```

```

passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n]));\n\n/**\n * True if threads are supported.\n */\n\n From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n]));\n } catch (e) {\n return false;\n }\n});\n\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd: {};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram="/this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"]}var scriptDirectory="";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=
nodePath["normalize"](filename);return

```



```

nodeFS["readFileSync"](filename,binary?null:"utf8");readBinary=function readBinary(filename){ var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)} assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"\\")}arguments_=process["arg
v"].slice(2);process["on"](["uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}}]);process["on"](["unhandledRejection",abort];quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]";var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
\\worker_threads\\ module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print} else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=="undefined"&&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("/")+1)}else{scriptDirectory=""}}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");readBinary=function readBinary(filename){ var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)} assert(ret.buffer);return
ret} }else{read_=function(url){ var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){ var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){ var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("perf_hooks").performance}} var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)} }var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!="object"){abort("no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var

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func=Module["_" + ident];assert(func,`Cannot call unknown function ` + ident + `, make sure it is exported`);return
func }function ccall(ident,returnType,argTypes,args,opts){var toC={`string`}:function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},`array`}:function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret };function
convertReturnValue(ret){if(returnType===`string`)return UTF8ToString(ret);if(returnType===`boolean`)return
Boolean(ret);return ret }var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i] }}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret }function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===`number`});var
numericRet=returnType!==`string`;if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts) }}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=``;while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue }var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue }var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023) }}return str }function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):`` }function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]|=192|u>>6;heap[outIdx++]|=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]|=224|u>>12;heap[outIdx++]|=128|u>>6&63;heap[outIdx
++]|=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]|=240|u>>18;heap[outIdx++]|=128|u>>12&63;heap[
outIdx++]|=128|u>>6&63;heap[outIdx++]|=128|u&63} }heap[outIdx]=0;return outIdx-startIdx }function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite) }function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10|str.charCodeAt(++i)&1023);if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len }function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer) }function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x }var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf) }var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new

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WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors
()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){ addOnPostRun(Module["postRun"].shift()) }callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=nul
l}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what+="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file:/^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+"wasmBinaryFile+"})}return response["arrayBuffer"]()).catch(function(){return

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getBinary(wasmBinaryFile))}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIROMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency("\wasm-
instantiate\")})))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("\wasm-instantiate\")}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}.then(receiver,function(reason){err("\failed to asynchronously prepare
wasm: "+reason);abort(reason)}))}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\function\&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\function\"){return fetch(wasmBinaryFile,{credentials:"same-
origin\").then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("\wasm streaming compile failed: "+reason);err("\falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm\"){try{var
exports=Module["instantiateWasm\"](info,receiveInstance);return exports}catch(e){err("\Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(Promise.reject);return{}}var
ASM_CONSTS={10520:function(){throw\Canceled!\},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\function\){callback(Module);continue}var func=callback.func;if(typeof
func===\number\){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg
)}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSIG:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
_emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var

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mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw`"Atomics.notify returned an unexpected value
`"+ret}Module["_emscripten_futex_wake"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw`"Internal Error! killThread() can only ever be
called from main application thread!";if(!pthread_ptr)throw`"Internal Error! Null pthread_ptr in
killThread!";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw`"Internal Error! cancelThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw`"Internal Error! Null pthread_ptr in
cancelThread!";var
pthread=PThread pthreads[pthread_ptr];pthread.worker.postMessage({"cmd\":"cancel"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw`"Internal Error! cleanupThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw`"Internal Error! Null pthread_ptr in
cleanupThread!";var
pthread=PThread pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb),initWorker:function(){},pthreads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\":"exit"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\":"cancelDone"})}},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.

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worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(function()
n(){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!="_pthread_self"){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"]);}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\' to target pthread '+d["targetThread"]+', but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\'processQueuedMainThread
Work\'){__emscripten_main_thread_process_queued_calls()}else
if(cmd===\'spawnThread\'){spawnThread(e.data)}else
if(cmd===\'cleanupThread\'){cleanupThread(d["thread"]);}else
if(cmd===\'killThread\'){killThread(d["thread"]);}else
if(cmd===\'cancelThread\'){cancelThread(d["thread"]);}else
if(cmd===\'loaded\'){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\'print\'){out("Thread \"+d["threadId"]+"":
'+d["text"]);}else if(cmd===\'printErr\'){err("Thread \"+d["threadId"]+"": '+d["text"]);}else
if(cmd===\'alert\'){alert("Thread \"+d["threadId"]+"": '+d["text"]);}else if(cmd===\'exit\'){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}}else
if(cmd===\'exitProcess\'){try{exit(d["returnCode"]);}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\'cancelDone\'){PThread.returnWorkerToPool(worker)}else
if(cmd===\'objectTransfer\'){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\'setImmediate\'){worker.postMessage(e.data)}else{err("worker sent an unknown command
'+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err("pthread sent
an error! \"+e.filename+"":'+e.lineno+":
'+e.message)};if(ENVIRONMENT_IS_NODE){worker.on("message",function(data){worker.onmessage({data:d
ata}});worker.on("error",function(data){worker.onerror(data)});worker.on("exit",function(data){})}worker.post
Message({"cmd":"load","urlOrBlob":"Module["mainScriptUrlOrBlob"]|_scriptDir,"wasmMemory":"wasmMe
memory","wasmModule":"wasmModule"}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile("tfjs-
backend-wasm-threaded-simd.worker.js");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}};function
establishStackSpace(stackTop,stackMax){__emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module["establishStackSpace"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module["getNoExitRuntime"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module["invokeEntryPoint"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort("Assertion failed: \"+UTF8ToString(condition)+"", at:
'+[filename?UTF8ToString(filename):'unknown filename'],line,func?UTF8ToString(func):'unknown
function')}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
__emscripten_get_now;if(ENVIRONMENT_IS_NODE){__emscripten_get_now=function(){var

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t=process[\"hrtime\"];return t[0]*1e3+t[1]/1e6 }else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!=\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\"cmd\": \"processQueuedMainThreadWork\"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\": \"processThreadQueue
e\"})}else {var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\": \"processThreadQueue\"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-
73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value
\"+ret}else {if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try {wasmMemory.grow(size-

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buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=_emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListene
rs:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return

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target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){ var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){ var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emsripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emsripten_set_canvas_element_size_calling_thread(target,width,height){ var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){ var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){ canvas.GLctxObject.GLctx.viewport(0,0,width,height) } } else
if(canvas.canvasSharedPtr){ var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emsripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1 } else { return-4 } return 0 }function
_emsripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emsripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){ var
canvas=findCanvasEventTarget(target);if(canvas){ return
_emsripten_set_canvas_element_size_calling_thread(target,width,height) } else { return
_emsripten_set_canvas_element_size_main_thread(target,width,height) } }function
_emsripten_set_current_thread_status(newStatus){ }function
_emsripten_set_thread_name(threadId,name){ }function __webgl_enable_ANGLE_instanced_arrays(ctx){ var
ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ ctx["vertexAttribDivisor"]=function(index,divisor){ ex
t["vertexAttribDivisorANGLE"](index,divisor) }; ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ ext["drawArraysInstancedANGLE"](mode,first,count,primcount) }; ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount) };
return 1 } }function __webgl_enable_OES_vertex_array_object(ctx){ var
ext=ctx.getExtension("OES_vertex_array_object");if(ext){ ctx["createVertexArray"]=function(){ return
ext["createVertexArrayOES"](); } ; ctx["deleteVertexArray"]=function(vao){ ext["deleteVertexArrayOES"](vao) };
ctx["bindVertexArray"]=function(vao){ ext["bindVertexArrayOES"](vao) }; ctx["isVertexArray"]=function(vao)

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{return ext[\"isVertexArrayOES\"](vao);return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffers
WEBGL\"](n,bufs);return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_dra
w\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contex
tHandle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)===\"\\\"){name=name.slice(0,name.lastIndexOf(\"\\\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+\"[\"+j+\"\\\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=[\"default\", \"low-power\", \"high-performance\"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var

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contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){stream===1?out:err}(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iiov,iiovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(5,1,fd,iiov,iiovcnt,pnum);var num=0;for(var i=0;i<iiovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iiov+i*8>>2];var len=GROWABLE_HEAP_I32()[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8)[ptr+j]}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasnTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd":"run","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthr
ead=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded

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){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined"){err(\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\");return
6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscipten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;+i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function
_emscipten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\"Blocking on the main thread is very dangerous, see
https://emscipten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function
__emscipten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread
pointer!\");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread
\\'+thread+' is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscipten_main_browser_thread_id()==thread){err(\"Main thread
\\'+thread+' is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread
\\'+thread+' , which does not point to a valid thread, or does not exist anymore!\");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread
\\'+thread+' , which was already detached!\");return
ERRNO_CODES.EINVAL}if(block){_emscipten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({\"cmd\": \"cleanupThread\", \"thread\": thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscipten_main_thre
ad_process_queued_calls();_emscipten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}}function _pthread_join(thread,status){return __emscipten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscipten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case

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159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]|1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscrip
ten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap
ply(null,arguments)};var

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_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"][["P"]]).a
pply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Modu
le["asm"][["Q"]]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][["R"]]).apply(null,argument
s)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module[
"asm"][["S"]]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][["T"]]).app
ly(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Modul
e["_Conv2DBackpropInput"]=Module["asm"][["U"]]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][["V"]]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][["W"]]).apply(null,argu
ments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize\
"]=Module["asm"][["X"]]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][["Y"]]).a
pply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace\"]=M
odule["asm"][["Z"]]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=M
odule["_DepthwiseConv2dNative"]=Module["asm"][["_"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][["$"]]).apply(null,arguments)
};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][["aa"]]).apply(null,ar
guments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][["ba"]]).apply(null,argument
s)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight\"]=Modul
e["asm"][["ca"]]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][["da"]]).apply(null,arg
uments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][["ea"]]).
apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchN
orm"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Modu
le["asm"][["ga"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=M
odule["_FusedDepthwiseConv2D"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][["ia"]]).apply(nul
l,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][["ja"
]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][["ka"]]).apply(
null,arguments)};var

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_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][_"Ia"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][_"ma"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"na"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ta"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"ua"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"za"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][_"Aa"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][_"Ba"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][_"Ca"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][_"Da"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][_"Ea"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"Fa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"Ga"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"Ia"]).apply(null,arguments)};var

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_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["La"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Va"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Xa"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ya"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Za"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["a"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["$a"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,arguments)};var

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_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"])[\["fb\"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"])[\["gb\"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"])[\["hb\"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"])[\["ib\"]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"])[\["jb\"]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"])[\["kb\"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=Module["asm"])[\["lb\"]).apply(null,arguments)};var
_pthread_self=Module["_pthread_self"]=function(){return(_pthread_self=Module["_pthread_self"]=Module["asm"])[\["mb\"]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"])[\["nb\"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=function(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=Module["asm"])[\["ob\"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=Module["asm"])[\["pb\"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=function(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=Module["asm"])[\["qb\"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"])[\["rb\"]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=Module["asm"])[\["sb\"]).apply(null,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=function(){return(_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=Module["asm"])[\["tb\"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=function(){return(_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=Module["asm"])[\["ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module["__emscripten_call_on_thread"]=function(){return(__emscripten_call_on_thread=Module["__emscripten_call_on_thread"]=Module["asm"])[\["vb\"]).apply(null,arguments)};var
_emscripten_tls_init=Module["_emscripten_tls_init"]=function(){return(_emscripten_tls_init=Module["_emscripten_tls_init"]=Module["asm"])[\["wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module["__emscripten_thread_init"]=function(){return(__emscripten_thread_init=Module["__emscripten_thread_init"]=Module["asm"])[\["xb\"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"])[\["yb\"]).apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"]

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][\`zb\`)].apply(null,arguments));var
stackAlloc=Module[\`stackAlloc\`=function(){return(stackAlloc=Module[\`asm\`][\`Ab\`
)].apply(null,arguments));var
_emsripten_stack_set_limits=Module[\`_emsripten_stack_set_limits\`=function(){return(_emsripten_stack_set_
limits=Module[\`_emsripten_stack_set_limits\`=Module[\`asm\`][\`Bb\`)].apply(null,arguments));var
_memalign=Module[\`_memalign\`=function(){return(_memalign=Module[\`_memalign\`=Module[\`asm\`][\`Cb
\`)].apply(null,arguments));var
__emsripten_allow_main_runtime_queued_calls=Module[\`__emsripten_allow_main_runtime_queued_calls\`=1
0512;var
__emsripten_main_thread_futex=Module[\`__emsripten_main_thread_futex\`=12148;Module[\`cwrap\`=cwrap
;Module[\`PThread\`=PThread;Module[\`PThread\`=PThread;Module[\`wasmMemory\`=wasmMemory;Module
[\`ExitStatus\`=ExitStatus;var calledRun;function
ExitStatus(status){this.name=\`ExitStatus\`;this.message=\`Program terminated with
exit(\`+status+\`)\`;this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\`cmd\`:\`loaded\`});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module[\`calledRun\`=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\`onRuntimeInitialized\`])Module[\`onRuntimeInitialized\`]();postRun(
)}if(Module[\`setStatus\`]){Module[\`setStatus\`]("\`Running...\`");setTimeout(function(){setTimeout(function(){Mo
dule[\`setStatus\`]("\`)\`"),1);doRun(),1)}else{doRun()}}Module[\`run\`=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\`cmd\`:\`exitProcess\`,\`returnCode\`:status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\`onExit\`])Module[\`onExit\`](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\`preInit\`]){if(typeof
Module[\`preInit\`]===\`function\`)Module[\`preInit\`]=[Module[\`preInit\`]];while(Module[\`preInit\`].length>0){
Module[\`preInit\`].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
());\n\n return WasmBackendModuleThreadedSimd.ready\`)\n\`);\n\`);)\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define[\`amd\`])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports[\`WasmBackendModuleThreadedSimd\`] =
WasmBackendModuleThreadedSimd;\n\`, "export const wasmWorkerContents = 'var Module={ };function
threadPrintErr(){var text=Array.prototype.slice.call(arguments).join("\` \`");console.error(text)}function
threadAlert(){var text=Array.prototype.slice.call(arguments).join("\`
\`");postMessage({cmd:\`alert\`,text:text,threadId:Module[\`_pthread_self\`]())}var
err=threadPrintErr;this.alert=threadAlert;Module[\`instantiateWasm\`=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module[\`wasmModule\`],info);Module[\`wasmModule\`=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\`load\`){Module[\`wasmModule\`=e.data.wa
smModule;Module[\`wasmMemory\`=e.data.wasmMemory;Module[\`buffer\`=Module[\`wasmMemory\`].buffer;
Module[\`ENVIRONMENT_IS_PTHREAD\`=true;if(typeof
e.data.urlOrBlob===\`string\`){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
if(e.data.cmd===\`objectTransfer\`){Module[\`PThread\`].receiveObjectTransfer(e.data)}else

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if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\")(0,1);try{var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\"
PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else
if(ex!==\"unwind!\"){if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}}else{Module[\"PThread\"].threadExit(ex.status)}}el
se{Module[\"PThread\"].threadExit(-2);throw ex}}}}else
if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}else
if(e.data.target===\"setimmediate\"){}else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()}else{err(\\\"worker.js received unknown command
\\\"+e.data.cmd);err(e.data)}}catch(ex){err(\\\"worker.js onmessage() captured an uncaught exception:
\\\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:___filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\\\"worker_threads\\\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\\\"message\\\",function(data){onmessage({data:data})});var
nodeFS=require(\\\"fs\\\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\\\"utf8\\\");}function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}};\", \"\\nvar
WasmBackendModule = (function() {\\n var _scriptId = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\\n if (typeof __filename !== 'undefined')
_scriptId = _scriptId || __filename;\\n return (\\nfunction(WasmBackendModule) {\\n WasmBackendModule =
WasmBackendModule || {};\\n\\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module[\\\"ready\\\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\\\"./this.program\\\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\\\"\\\";function
locateFile(path){if(Module[\\\"locateFile\"]){return Module[\\\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\\\"path\\\").
dirname(scriptDirectory)+\\\"^\\\"}else{scriptDirectory=__dirname+\\\"^\\\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\\\"fs\\\");if(!nodePath)nodePath=require(\\\"path\\\");filename=n
odePath[\\\"normalize\\\"](filename);return
nodeFS[\\\"readFileSync\\\"](filename,binary?null:\\\"utf8\\\");};readBinary=function readBinary(filename){var

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ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\/g,\"\\\")arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(!_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!=\"\")scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"^\")+1)}else{scriptDirectory=\"\"}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"]arguments_=Module[\"arguments\"]};if(Module[\"thisProgram\"]thisProgram=
Module[\"thisProgram\"]};if(Module[\"quit\"]quit_=Module[\"quit\"]};var
wasmBinary;if(Module[\"wasmBinary\"]wasmBinary=Module[\"wasmBinary\"]};var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!=\"object\"){abort(\"no native wasm
support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!=\"\"){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!=\"0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!=\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof

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TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=Module["preRun"];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=Module["postRun"];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepen
dencies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module

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["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix=\"data:application/octet-stream;base64,\";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-
wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the
wasm failed\"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
\"+wasmBinaryFile+\"\"}return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-
instantiate\")}addRunDependency(\"wasm-instantiate\");function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize

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+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true }return false }var
SYSCALLS={ mappings:{ },buffers:[null,[],[]],printChar:function(stream,curr){ var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){ var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iiovcnt,pnum){ var num=0;for(var
i=0;i<iiovcnt;i++){ var ptr=HEAP32[iiov+i*8>>2];var len=HEAP32[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _thread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{ if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1 }}setErrNo(28);return-1 }var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar

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guments));var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"]["v"]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"]["w"]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"]["x"]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"]["y"]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"]["z"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["A"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"]["B"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["C"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"]["D"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["E"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["F"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"]["G"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["H"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"]["I"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"]["J"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"]["N"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]["Q"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]["R"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["asm"]["S"]).apply(null,arguments)};var

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odule["_FusedDepthwiseConv2D"]=Module["_asm"]["_S"].apply(null,arguments));var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["_asm"]["_T"]).apply(null
,arguments));var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["_asm"]["_U"
]).apply(null,arguments));var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["_asm"]["_V"]).apply(
null,arguments));var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module[
"asm"]["_W"]).apply(null,arguments));var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["_asm"][
"X"]).apply(null,arguments));var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["_asm"]["_Y"]).apply(null,argume
nts));var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["_asm"][
"Z"]).apply(null,arguments));var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["_asm"]["_").apply(null,arguments
));var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["_asm
"]["_\$"]).apply(null,arguments));var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["_asm"]["_aa"]).apply(null,argume
nts));var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["_asm"]["_ba"]).
apply(null,arguments));var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["_asm"]["_ca"
]).apply(null,arguments));var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["_asm"]["_da"]).apply(null,ar
guments));var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["_asm"]["_ea"]).apply(null,argumen
ts));var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["_asm"]["_fa"
]).apply(null,arguments));var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["_asm"][
"ga"]).apply(null,arguments));var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["_asm"][
"ha"]).apply(null,arguments));var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["_asm"]["_ia"]).apply(null,argument
s));var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Mod
ule["_NonMaxSuppressionV3"]=Module["_asm"]["_ja"]).apply(null,arguments));var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Mod
ule["_NonMaxSuppressionV4"]=Module["_asm"]["_ka"]).apply(null,arguments));var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Mod
ule["_NonMaxSuppressionV5"]=Module["_asm"]["_la"]).apply(null,arguments));var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["_asm"][
"ma"]).apply(null,arguments));var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["_asm"]["_na"]).apl
y(null,arguments));var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["_asm"]["_oa"]).apply(nul

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l,arguments));var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["pa"]]).apply(null,arguments));var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["qa"]]).apply(null,arguments));var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["ra"]]).apply(null,arguments));var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["sa"]]).apply(null,arguments));var
_Rel=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["ta"]]).apply(null,arguments));var
_Rel6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,arguments));var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["va"]]).apply(null,arguments));var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).apply(null,arguments));var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["xa"]]).apply(null,arguments));var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(null,arguments));var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments));var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments));var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments));var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments));var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Da"]]).apply(null,arguments));var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Ea"]]).apply(null,arguments));var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Fa"]]).apply(null,arguments));var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Ga"]]).apply(null,arguments));var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ha"]]).apply(null,arguments));var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Ia"]]).apply(null,arguments));var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["Ja"]]).apply(null,arguments));var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["Ka"]]).apply(null,arguments));var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["La"]]).apply(null,arguments));var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["Ma"]]).apply(null,arguments));var

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ts});var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["Na"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["Oa"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["Pa"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["Qa"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["Ra"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"]["Sa"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["Ta"]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["Ua"]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"]["Va"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"]["Wa"]).apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"]["Xa"]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"]["Ya"]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+"");this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"](""),1);doRun()},1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport './flags_wasm';\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from

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'../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount: number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap: DataStorage<TensorData>;\n\n constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape: number[], dtype: DataType): DataId {\n const dataId = {id: this.dataIdNextNumber++};\n this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start = util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n\n move(dataId: DataId, values: backend_util.BackendValues, shape: number[], dtype: DataType, refCount: number): void {\n const id = this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n this.dataIdMap.set(dataId, {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n }\n const size = util.sizeFromShape(shape);\n const numBytes = size * util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n if (values != null) {\n this.wasm.HEAPU8.set(new Uint8Array(values as backend_util.TypedArray).buffer, (values as backend_util.TypedArray).byteOffset, numBytes, memoryOffset);\n }\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return this.readSync(dataId);\n }\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset, dtype, shape, stringBytes} = this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n }\n const bytes = this.wasm.HEAPU8.slice(memoryOffset, memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n }\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory is released, false otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data = this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n }\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n this.dataIdMap.delete(dataId);\n }\n return true;\n }\n\n /** Return refCount of a `TensorData` */\n refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData = this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n\n incRef(dataId: DataId) {\n const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n\n floatPrecision(): 32 {\n return 32;\n }\n\n // Returns the memory offset of a tensor. Useful for debugging and unit testing.\n getMemoryOffset(dataId: DataId): number {\n return this.dataIdMap.get(dataId).memoryOffset;\n }\n\n dispose() {\n this.wasm.tfjs.dispose();\n if ('PThread' in this.wasm) {\n this.wasm.PThread.terminateAllThreads();\n }\n this.wasm = null;\n }\n\n memory() {\n return {unreliable: false};\n }\n\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not present, this method allocates memory on the WASM heap. If `memoryOffset` is present, the memory was allocated elsewhere (in c++) and we just record the pointer where that memory lives.\n */\n makeOutput(shape: number[], dtype: DataType, memoryOffset?: number): TensorInfo {\n let dataId: {};\n if (memoryOffset == null) {\n dataId = this.write(null /* values */, shape, dtype);\n } else {\n const id = this.dataIdNextNumber++;\n dataId = {id};\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n const size = util.sizeFromShape(shape);\n this.wasm.tfjs.registerTensor(id, size,\n
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memoryOffset);\n }\n return {dataId, shape, dtype};\n }\n\n typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n backend_util.TypedArray {\n const buffer = this.wasm.HEAPU8.buffer;\n const\n {memoryOffset} = this.dataIdMap.get(dataId);\n const size = util.sizeFromShape(shape);\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer, memoryOffset, size);\n case 'int32':\n return new\n Int32Array(buffer, memoryOffset, size);\n case 'bool':\n return new Uint8Array(buffer, memoryOffset,\n size);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n }\n\nfunction
createInstantiateWasmFunc(path: string) {\n // this will be replace by rollup plugin patchWechatWebAssembly in\n // miniprogram's output.\n // tslint:disable-next-line:no-any\n return (imports: any, callback: any) => {\n util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n if (!response['ok']) {\n imports.env.a(`failed to load wasm binary file at '${path}'`);\n }\n response.arrayBuffer().then(binary => {\n WebAssembly.instantiate(binary, imports).then(output => {\n callback(output.instance, output.module);\n });\n });\n });\n return {};\n };\n }\n\n\n**\n * Returns the path of the WASM binary.\n * @param
simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n *
@param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n simdSupported: boolean, threadsSupported: boolean,\n wasmModuleFolder: string) {\n if (wasmPath != null) {\n // If wasmPath is defined, the user has supplied a full path to\n // the vanilla .wasm binary.\n return\n wasmPath;\n }\n\n let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n if (simdSupported &&\n threadsSupported) {\n path = 'tfjs-backend-wasm-threaded-simd.wasm';\n } else if (simdSupported) {\n path =\n 'tfjs-backend-wasm-simd.wasm';\n }\n\n if (wasmFileMap != null) {\n if (wasmFileMap[path] != null) {\n return\n wasmFileMap[path];\n }\n }\n\n return\n wasmModuleFolder + path;\n }\n\n\n**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in
Chrome 76).\n * ^next export async function init(): Promise<{wasm: BackendWasmModule}> {\n const\n [simdSupported, threadsSupported] = await Promise.all([\n env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n]);\n return\n new Promise((resolve, reject) => {\n const\n factoryConfig: WasmFactoryConfig = {};\n /**\n * This function overrides the Emscripten
module locateFile utility.\n * @param path The relative path to the file that needs to be loaded.\n * @param\n prefix The path to the main JavaScript file's directory.\n */\n factoryConfig.locateFile = (path, prefix) => {\n if\n (path.endsWith('.worker.js')) {\n const\n response = wasmWorkerContents;\n const\n blob = new\n Blob([response], {type: 'application/javascript'});\n return\n URL.createObjectURL(blob);\n }\n\n if\n (path.endsWith('.wasm')) {\n return\n getPathToWasmBinary(\n simdSupported as boolean,\n threadsSupported as boolean,\n wasmPathPrefix != null ?\n wasmPathPrefix : prefix);\n }\n\n return\n prefix\n + path;\n };\n\n // Use the instantiateWasm override when system fetch is not available.\n // Reference:\n //
https://github.com/emscripten-core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n if\n (customFetch) {\n factoryConfig.instantiateWasm =\n createInstantiateWasmFunc(getPathToWasmBinary(\n simdSupported as boolean, threadsSupported as\n boolean,\n wasmPathPrefix != null ?\n wasmPathPrefix : ''));\n }\n\n let\n initialized = false;\n\n factoryConfig.onAbort = () => {\n if\n (initialized) {\n // Emscripten already called console.warn so no need to\n double\n log.\n return;\n }\n if\n (initAborted) {\n // Emscripten calls `onAbort` twice, resulting in double\n error.\n // messages.\n return;\n }\n\n initAborted = true;\n const\n rejectMsg =\n `Make sure the server can serve the `.wasm` file relative to the ` +\n `bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers`;\n reject\n ({message: rejectMsg});\n };\n\n let\n wasm: Promise<BackendWasmModule>;\n // If `wasmPath` has
been defined we must initialize the vanilla module.\n if\n (threadsSupported &&\n simdSupported &&\n wasmPath ==\n null) {\n factoryConfig.mainScriptUrlOrBlob = new\n Blob([\n var\n WasmBackendModuleThreadedSimd = ` +\n wasmFactoryThreadedSimd.toString(),\n {type: 'text/javascript'}\n]);\n wasm =\n wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD
```

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binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully
 created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string =
 null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init:
 module.cwrap('init', null, []),\n initWithThreadsCount:\n module.cwrap('init_with_threads_count', null,
 ['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor:
 module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType,
 ['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n }; \n\n resolve({ wasm: module });\n });\n};\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case
'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ninterface
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\n\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n ' will be removed in a future release.);\n if
(initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n
 '\n `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n }\n wasmPath = path;\n customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * @param js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
```\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n *
SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n *
full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n * @doc {heading:
'Environment', namespace: 'wasm'}\n */\n\nexport function setWasmPaths(\n  prefixOrFileMap: string | {[key in
WasmBinaryName]?: string},\n  usePlatformFetch = false): void {\n  if (initAborted) {\n    throw new Error(\n
'The WASM backend was already initialized. Make sure you call ' +\n      '\n      `setWasmPaths()` before you call
`tf.setBackend()` or ' +\n      '\n      `tf.ready()`);\n  }\n\n  if (typeof prefixOrFileMap === 'string') {\n    wasmPathPrefix
= prefixOrFileMap;\n  } else {\n    wasmFileMap = prefixOrFileMap;\n    const missingPaths =\n      wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n    if (missingPaths.length > 0) {\n      throw new
Error(\n        `There were no entries found for the following binaries: ` +\n        ` ${missingPaths.join(',')}. Please
either call setWasmPaths with a ` +\n        ` map providing a path for each binary, or with a string indicating ` +\n
        ` the directory where all the binaries can be found.`);\n    }\n  }\n\n  customFetch = usePlatformFetch;\n}\n\n/**
Used in unit tests. */\n\nexport function resetWasmPath(): void {\n  wasmPath = null;\n  wasmPathPrefix = null;\n
wasmFileMap = {};\n  customFetch = false;\n  initAborted = false;\n}\n\nlet threadsCount = -1;\nlet
actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n *
threadpool (default to the number of logical CPU cores).\n * @param\n * This must be called before calling
`tf.setBackend('wasm')`.\n */\n\nexport function setThreadsCount(numThreads: number) {\n  threadsCount =

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numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the
backend is initialized.\n *\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n
throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n\n"/** @license See the
LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport
{version};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm,
init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\n\nexport {version as version_wasm} from './version';\n\nconst
WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new
BackendWasm(wasm);\n},
WASM_PRIORITY);\n\n", "names": ["setup", "wasmFunc", "sliceImplCPU", "concatImplCPU", "supportsFullBroadcas
t", "setupFunc", "kernelFunc", "rangeImplCPU", "require$$0", "require$$1", "require$$2", "global", "require$$3", "requir
e$$4", "wasmFactoryThreadedSimd", "wasmFactory"], "mappings": ";;;;;;;;;;;;;AAAA;;;;;;;;;;;;;;AAiBA;AAC
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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.fesm.js.map

No license file was found, but licenses were detected in source scan.

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=====\n *\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from  
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {slice} from  
'./Slice';\nfunction unpack(\n  args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs});\nTensorInfo[] {\n  const {inputs, backend, attrs} = args;\n  const {value} = inputs;\n  let {axis} = attrs;\n  if (axis <  
0) {\n    axis += value.shape.length;\n  }\n  const numOutputs = value.shape[axis];\n  const rank =
```

```
value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank;\n i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new\n Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size},\n backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n }\n\nexport const\n unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as { } as\n KernelFunc,\n};\n"}}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-  
wasm/dist/kernels/Unpack.js.map
```

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```

```
* =====*/
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-  
wasm/src/cc/kernels/Floor.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/unary.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-  
wasm/src/cc/kernels/PadV2.h
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
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```

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
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```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
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wasm/src/cc/kernels/Round.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/SelectV2.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Softmax.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FlipLeftRight.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/StridedSlice.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Softmax.h
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/NotEqual.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/NonMaxSuppressionV4.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Neg.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/batch_mat_mul_impl.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/PadV2_test.cc

No license file was found, but licenses were detected in source scan.

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```

```
=====\n*\n\nimport { Cos, KernelConfig } from 'tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cosh.js.map

No license file was found, but licenses were detected in source scan.

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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\\n
*/\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cosh.js.map

No license file was found, but licenses were detected in source scan.

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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\\n
*/\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {rangeImplCPU} from './kernel_utils/shared';\n\nexport const
range =\n  (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n    const {backend, attrs} =
args;\n    const {start, stop, step, dtype} = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n\n    const out = backend.makeOutput([values.length], dtype);\n    const outVals =
backend.toArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\nexport const rangeConfig:
```

```
KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as { } as\n KernelFunc\n};\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Range.js.map
```

1.312 flyway-test 6.4.0

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```

Found in path(s):

```
* /opt/cola/permits/1129909867_1612394256.07/0/flyway-test-6-4-0-sources-jar/org/flywaydb/test/annotation/package-info.java\n* /opt/cola/permits/1129909867_1612394256.07/0/flyway-test-6-4-0-sources-jar/org/flywaydb/test/annotation/FlywayTest.java\n* /opt/cola/permits/1129909867_1612394256.07/0/flyway-test-6-4-0-sources-jar/org/flywaydb/test/annotation/FlywayTests.java
```

1.313 snake-yaml 1.26

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1.314 reactive-streams 1.0.3

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```

Found in path(s):

```
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-
jar/org/reactivestreams/Publisher.java
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-
jar/org/reactivestreams/FlowAdapters.java
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-
jar/org/reactivestreams/Processor.java
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-
jar/org/reactivestreams/Subscription.java
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-
jar/org/reactivestreams/Subscriber.java
```

1.315 mpdecimal 2.4.2

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1.317 jackson-databind-nullable 0.2.1

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1.318 libgcrypto 1.8.5-5ubuntu1

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* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/UnixChannelOption.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/package-info.java
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sources-jar/io/netty/channel/unix/PreferredDirectByteBufAllocator.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/io/netty/channel/unix/Buffer.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
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sources-jar/netty_unix_jni.h
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
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sources-jar/io/netty/channel/unix/DomainSocketChannel.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/io/netty/channel/unix/ServerDomainSocketChannel.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/netty_unix_socket.c
```


* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DomainSocketAddress.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DatagramSocketAddress.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_filedescriptor.h
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_filedescriptor.c
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/NativeInetAddress.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DomainSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_socket.h
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_errors.h
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* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_errors.c
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* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DomainSocketReadMode.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/Errors.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/UnixChannel.java

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sources-jar/io/netty/channel/unix/PeerCredentials.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/io/netty/channel/unix/SocketWritableByteChannel.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/netty_unix_util.c
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/netty_unix_limits.h
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/netty_unix_util.h
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/io/netty/channel/unix/ErrorsStaticallyReferencedJniMethods.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/netty_unix_limits.c
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
sources-jar/io/netty/channel/unix/Limits.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-
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1.323 libnfnetlink 1.0.1

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1.324 kerberos 1.11.1

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cmd/krb5/slave/kpropd_rpc.c
lib/gss_mechs/mech_krb5/et/kdb5_err.c
lib/gss_mechs/mech_spnego/mech/gssapiP_spnego.h
lib/gss_mechs/mech_spnego/mech/spnego_mech.c
lib/krb5/kadm5/kadm_host_srv_names.c
lib/krb5/kdb/kdb_convert.c
lib/krb5/kdb/kdb_hdr.h
lib/krb5/kdb/kdb_log.c
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lib/libgss/g_acquire_cred.c
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lib/libgss/g_utils.c
lib/libgss/g_verify.c
lib/libgss/gssd_pname_to_uid.c
uts/common/gssapi/include/gssapi_err_generic.h

uts/common/gssapi/include/mechglueP.h

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- lib/gssapi/mechglue/g_accept_sec_context.c
- lib/gssapi/mechglue/g_acquire_cred.c
- lib/gssapi/mechglue/g_canon_name.c
- lib/gssapi/mechglue/g_compare_name.c
- lib/gssapi/mechglue/g_context_time.c
- lib/gssapi/mechglue/g_delete_sec_context.c
- lib/gssapi/mechglue/g_dsp_name.c
- lib/gssapi/mechglue/g_dsp_status.c
- lib/gssapi/mechglue/g_dup_name.c
- lib/gssapi/mechglue/g_exp_sec_context.c
- lib/gssapi/mechglue/g_export_name.c
- lib/gssapi/mechglue/g_glue.c
- lib/gssapi/mechglue/g_imp_name.c
- lib/gssapi/mechglue/g_imp_sec_context.c
- lib/gssapi/mechglue/g_init_sec_context.c
- lib/gssapi/mechglue/g_initialize.c
- lib/gssapi/mechglue/g_inquire_context.c
- lib/gssapi/mechglue/g_inquire_cred.c
- lib/gssapi/mechglue/g_inquire_names.c
- lib/gssapi/mechglue/g_process_context.c
- lib/gssapi/mechglue/g_rel_buffer.c
- lib/gssapi/mechglue/g_rel_cred.c
- lib/gssapi/mechglue/g_rel_name.c
- lib/gssapi/mechglue/g_rel_oid_set.c
- lib/gssapi/mechglue/g_seal.c
- lib/gssapi/mechglue/g_sign.c
- lib/gssapi/mechglue/g_store_cred.c
- lib/gssapi/mechglue/g_unseal.c
- lib/gssapi/mechglue/g_userok.c
- lib/gssapi/mechglue/g_utils.c
- lib/gssapi/mechglue/g_verify.c
- lib/gssapi/mechglue/gssd_pname_to_uid.c
- lib/gssapi/mechglue/mglueP.h
- lib/gssapi/mechglue/oid_ops.c
- lib/gssapi/spnego/gssapiP_spnego.h
- lib/gssapi/spnego/spnego_mech.c

and the initial implementation of incremental propagation, including the following new or changed files:

- include/iprop_hdr.h
- kadmin/server/ipropd_svc.c
- lib/kdb/iprop.x
- lib/kdb/kdb_convert.c

lib/kdb/kdb_log.c
lib/kdb/kdb_log.h
lib/krb5/error_tables/kdb5_err.et
kprop/kpropd_rpc.c
kprop/kproplog.c

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1.329 hawtjni-runtime 1.17

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Found in path(s):

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecuritySchemes.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/headers/Header.java

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* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Encoding.java

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* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/DiscriminatorMapping.java

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* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/extensions/Extensions.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/ServerVariable.java

1.331 glibc 2.23

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@item

Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

@item

Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

@item

If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

@item

Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

@end enumerate

For an executable, the required form of the ``work that uses the Library'' must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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@item

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@enumerate a

@item

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@item

Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

@end enumerate

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@end enumerate

@subheading END OF TERMS AND CONDITIONS

@page

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@end smallexample
```

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```
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`Frob' (a library for tweaking knobs) written by James Random Hacker.
```

```
@var{signature of Ty Coon}, 1 April 1990
Ty Coon, President of Vice
@end smallexample
```

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jar/org/springframework/jdbc/support/incrementer/DB2MainframeSequenceMaxValueIncrementer.java

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jar/org/springframework/jdbc/support/SQLExceptionSubclassTranslator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/lob/DefaultLobHandler.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/AbstractDriverBasedDataSource.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/xml/Jdbc4SqlXmlHandler.java
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jar/org/springframework/jdbc/datasource/lookup/BeanFactoryDataSourceLookup.java
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jar/org/springframework/jdbc/support/lob/PassThroughClob.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/PostgresCallMetaDataProvider.java
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jar/org/springframework/jdbc/core/ParameterDisposer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/support/SqlLobValue.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/SybaseCallMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/DelegatingDataSource.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/lob/PassThroughBlob.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseFactoryBean.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/init/DataSourceInitializer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/config/InitializeDatabaseBeanDefinitionParser.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/simple/SimpleJdbcInsert.java
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jar/org/springframework/jdbc/config/EmbeddedDatabaseBeanDefinitionParser.java
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jar/org/springframework/jdbc/support/CustomSQLExceptionCodesTranslation.java
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jar/org/springframework/jdbc/datasource/ConnectionProxy.java
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jar/org/springframework/jdbc/datasource/lookup/AbstractRoutingDataSource.java
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/embedded/SimpleDriverDataSourceFactory.java
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jar/org/springframework/jdbc/datasource/lookup/SingleDataSourceLookup.java
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jar/org/springframework/jdbc/datasource/lookup/DataSourceLookupFailureException.java
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jar/org/springframework/jdbc/datasource/SmartDataSource.java
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jar/org/springframework/jdbc/core/InterruptibleBatchPreparedStatementSetter.java
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jar/org/springframework/jdbc/SQLWarningException.java
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jar/org/springframework/jdbc/datasource/lookup/IndiDataSourceLookup.java
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jar/org/springframework/jdbc/object/GenericStoredProcedure.java
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jar/org/springframework/jdbc/support/xml/XmlBinaryStreamProvider.java
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jar/org/springframework/jdbc/core/JdbcOperations.java
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jar/org/springframework/jdbc/datasource/init/ResourceDatabasePopulator.java

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jar/org/springframework/jdbc/core/simple/AbstractJdbcCall.java

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jar/org/springframework/jdbc/support/SQLStateSQLExceptionTranslator.java

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/LazyConnectionDataSourceProxy.java

* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/TransactionAwareDataSourceProxy.java

* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/CustomSQLExceptionTranslatorRegistry.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/simple/AbstractJdbcInsert.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/rowset/ResultSetWrappingSqlRowSet.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/JdbcTransactionObjectSupport.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/namedparam/BeanPropertySqlParameterSource.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/object/SqlFunction.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/BeanPropertyRowMapper.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/namedparam/AbstractSqlParameterSource.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/support/AbstractLobStreamingResultSetExtractor.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/PreparedStatementCreatorFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/rowset/SqlRowSet.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/namedparam/MapSqlParameterSource.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/namedparam/NamedParameterUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/JdbcUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/object/RdbmsOperation.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/KeyHolder.java

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```

*/
/**
 * Implement this interface when parameters need to be customized based
 * on the connection. We might need to do this to make use of proprietary
 * features, available only with a specific Connection type.
 *
 * @author Rod Johnson
 * @author Thomas Risberg
 * @see CallableStatementCreatorFactory#newCallableStatementCreator(ParameterMapper)
 * @see org.springframework.jdbc.object.StoredProcedure#execute(ParameterMapper)
 */
/**
 * Create a Map of input parameters, keyed by name.
 * @param con a JDBC connection. This is useful (and the purpose of this interface)
 * if we need to do something RDBMS-specific with a proprietary Connection
 * implementation class. This class conceals such proprietary details. However,
 * it is best to avoid using such proprietary RDBMS features if possible.
 * @return a Map of input parameters, keyed by name (never {@code null})
 * @throws SQLException if an SQLException is encountered setting
 * parameter values (that is, there's no need to catch SQLException)
 */

```

Found in path(s):

```

* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ParameterMapper.java

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```

* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/JdbcOperationsExtensions.kt

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/support/AbstractLobCreatingPreparedStatementCallback.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/lob/AbstractLobHandler.java
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```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/init/DatabasePopulator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/lob/LobHandler.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/DatabaseMetaDataCallback.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/PreparedStatementSetter.java
```

```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/RowCallbackHandler.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/lookup/DataSourceLookup.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/ParsedSql.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/init/CompositeDatabasePopulator.java
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* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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* limitations under the License.
*/
/**
* Strategy interface for translating between { @link SQLException SQLExceptions }
* and Spring's data access strategy-agnostic { @link DataAccessException }
* hierarchy.
*
* <p>Implementations can be generic (for example, using
* { @link java.sql.SQLException#getSQLState() SQLState } codes for JDBC) or wholly
* proprietary (for example, using Oracle error codes) for greater precision.
*
* @author Rod Johnson
* @author Juergen Hoeller
* @see org.springframework.dao.DataAccessException
*/
```

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```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/SQLExceptionTranslator.java
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```

```
/**
* The classes in this package make JDBC easier to use and
* reduce the likelihood of common errors. In particular, they:
* <ul>
```

- * Simplify error handling, avoiding the need for try/catch/finally blocks in application code.
 - * Present exceptions to application code in a generic hierarchy of unchecked exceptions, enabling applications to catch data access exceptions without being dependent on JDBC, and to ignore fatal exceptions there is no value in catching.
 - * Allow the implementation of error handling to be modified to target different RDBMSes without introducing proprietary dependencies into application code.
- *
- * <p>This package and related packages are discussed in Chapter 9 of Expert One-On-One J2EE Design and Development by Rod Johnson (Wrox, 2002).
- */

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/package-info.java

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabase.java

* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/init/ScriptStatementFailedException.java

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* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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* limitations under the License.
*/
/**
```

```
* Close this LobCreator session and free its temporarily created BLOBs and CLOBs.
* Will not need to do anything if using PreparedStatement's standard methods,
* but might be necessary to free database resources if using proprietary means.
* <p><b>NOTE</b></p>: Needs to be invoked after the involved PreparedStatements have
* been executed or the affected O/R mapping sessions have been flushed.
* Otherwise, the database resources for the temporary BLOBs might stay allocated.
*/
```

Found in path(s):

```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/lob/LobCreator.java
```

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/MySQLMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/NamedParameterBatchUpdateUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
```

jar/org/springframework/jdbc/core/metadata/TableMetaDataProviderFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/DerbyTableMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/HsqlTableMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/lookup/IsolationLevelDataSourceRouter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/RowCountCallbackHandler.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/rowset/ResultSetWrappingSqlRowSetMetaData.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlReturnResultSet.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/xml/SqlXmlHandler.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/simple/SimpleJdbcInsertOperations.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/ConnectionHolder.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/AbstractDataFieldMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ArgumentTypePreparedStatementSetter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/support/JdbcBeanDefinitionReader.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ParameterizedPreparedStatementSetter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/LobRetrievalFailureException.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseConfigurer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlTypeValue.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/AbstractFallbackSQLExceptionTranslator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/StoredProcedure.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlInOutParameter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/OracleSequenceMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/RowMapper.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ResultSetSupportingSqlParameter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/TableParameterMetaData.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-

jar/org/springframework/jdbc/object/SqlUpdate.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/SQLExceptionTranslator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/simple/SimpleJdbcCallOperations.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/DerbyCallMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/PostgresTableMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/CustomSQLExceptionTranslatorRegistrar.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/AbstractIdentityColumnMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/IncorrectResultSetColumnCountException.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/SimpleConnectionHandle.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/MappingSqlQueryWithParameters.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/Db2LuwMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/H2EmbeddedDatabaseConfigurer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/SqlQuery.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/config/DatabasePopulatorConfigUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/WebSphereDataSourceAdapter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/ConnectionHandle.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/IsolationLevelDataSourceAdapter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/AbstractDataSource.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/SqlParameterSourceUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/MappingSqlQuery.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/UncategorizedSQLException.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/SqlCall.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/UpdatableSqlQuery.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/simple/SimpleJdbcCall.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-

jar/org/springframework/jdbc/core/metadata/CallParameterMetaData.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ArgumentPreparedStatementSetter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/PreparedStatementCallback.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseConfigurerFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/OracleTableMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/SqlOperation.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/SQLExceptionCodesFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseBuilder.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ConnectionCallback.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/NamedParameterJdbcDaoSupport.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/CallMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/OutputStreamFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/PostgreSQLSequenceMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlParameterValue.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/PreparedStatementCreator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/PostgresSequenceMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/Db2CallMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/Db2MainframeMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/CallMetaDataContext.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/DatabaseStartupValidator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/CannotGetJdbcConnectionException.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlParameter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/CallableStatementCreator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/DerbyEmbeddedDatabaseConfigurer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-

jar/org/springframework/jdbc/core/CallableStatementCallback.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/DataSourceUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/BadSqlGrammarException.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/support/AbstractInterruptibleBatchPreparedStatementSetter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/HsqlSequenceMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlRowSetResultSetExtractor.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/lookup/MapDataSourceLookup.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/H2SequenceMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/InvalidResultSetAccessException.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/SQLErrorCodes.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseType.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/CallableStatementCreatorFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/SybaseAnywhereMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/RowMapperResultSetExtractor.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/TableMetaDataContext.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
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jar/org/springframework/jdbc/core/ColumnMapRowMapper.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/support/JdbcDaoSupport.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/JdbcUpdateAffectedIncorrectNumberOfRowsException.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/UserCredentialsDataSourceAdapter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-

jar/org/springframework/jdbc/support/incrementer/SybaseMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/BatchUpdateUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ResultSetExtractor.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/HanaSequenceMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/EmptySqlParameterSource.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlReturnUpdateCount.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/DerbyMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SqlOutParameter.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/lob/TemporaryLobCreator.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/support/AbstractSqlTypeValue.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/GenericSqlQuery.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/TableMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/config/SortedResourcesFactoryBean.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/JdbcAccessor.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/StatementCallback.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/object/BatchSqlUpdate.java

1.334 attr 2.4.48-5

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Version 2.1, February 1999

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1.335 objenesis 3.1

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1.336 util-linux 2.28

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 */
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```
NR START END SECTORS SIZE NAME UUID
1 32 7679 7648 3.7M 8f8378c0-01
2 7680 16383 8704 4.3M 8f8378c0-02
5 7936 12799 4864 2.4M
6 12544 16127 3584 1.8M
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./0123456789;:<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

!"#\$%&'()*+,-
./0123456789;:<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~WEV @@
WEV[B "1

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1.337 junixsocket-common 2.3.2

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```
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/Closeables.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/AFUNIXSocket.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/AFUNIXSocketCredentials.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/AFUNIXServerSocket.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/NativeLibraryLoader.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/AFUNIXSocketCapability.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/AFUNIXSocketImpl.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/SuppressFBWarnings.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/AFUNIXSocketAddress.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
jar/org/newsclub/net/unix/NativeUnixSocket.java
* /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-
```

1.338 @tensorflow/tfjs-core 3.11.0

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1.339 expat 2.2.4

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1.340 netty-codec 4.1.51.Final

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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufVarint32FrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/ProtocolDetectionResult.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufVarint32LengthFieldPrepender.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufEncoderNano.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufDecoderNano.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/UnsupportedValueConverter.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/ProtocolDetectionState.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/HeadersUtils.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufEncoder.java

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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DefaultHeaders.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/EmptyHeaders.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/Headers.java

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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/JdkZlibDecoder.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/xml/XmlFrameDecoder.java

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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/AsciiHeadersEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/FastLzFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Lz4FrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/LzmaFrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2DivSufSort.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2HuffmanStageDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/FastLz.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2MoveToFrontTable.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2BlockCompressor.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/FastLzFrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageAggregationException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Crc32.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/json/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2HuffmanStageEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
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jar/io/netty/handler/codec/compression/Bzip2Decoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/LzfEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2MTFAndRLE2StageEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2BlockDecompressor.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Lz4Constants.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DecoderResultProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Lz4FrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2Encoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/LzfDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2BitWriter.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2Constants.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2HuffmanAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/json/JsonObjectDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2Rand.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/SnappyFramedDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/Lz4XXHash32.java

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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DelimiterBasedFrameDecoder.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ObjectDecoder.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ReferenceMap.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallerProvider.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/CompatibleMarshallingDecoder.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/base64/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/CompactObjectInputStream.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/TooLongFrameException.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallingDecoder.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/PrematureChannelClosureException.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/JdkZlibEncoder.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-

jar/io/netty/handler/codec/marshalling/LimitingByteInput.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/DecompressionException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ThreadLocalUnmarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/MarshallingEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ObjectEncoderOutputStream.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ObjectEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ChannelBufferByteOutput.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/CodecException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ReplayingDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageToMessageEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/EncoderException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/bytes/ByteArrayDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ClassLoaderClassResolver.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/UnmarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ClassResolver.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageToMessageDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/LineBasedFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/UnsupportedMessageTypeException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ContextBoundUnmarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibUtil.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibWrapper.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibCodecFactory.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ObjectDecoderInputStream.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-

jar/io/netty/handler/codec/ByteToMessageCodec.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/CorruptedFrameException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/StringEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ClassResolvers.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/JZlibDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageAggregator.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/base64/Base64Decoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/bytes/ByteArrayEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/protobuf/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/DefaultUnmarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/xml/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/CompressionException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/base64/Base64Encoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ByteToMessageDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DecoderException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/LengthFieldPrepender.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/SoftReferenceMap.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/SnappyFrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageToMessageCodec.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/bytes/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-

jar/io/netty/handler/codec/MessageToByteEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/DefaultMarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/StringDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/CompactObjectOutputStream.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ReplayingDecoderByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DecoderResult.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/Delimiters.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/JZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/FixedLengthFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/CachingClassResolver.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/SnappyFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Snappy.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/CompatibleMarshallingEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ThreadLocalMarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ChannelBufferByteInput.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/CompatibleObjectEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/WeakReferenceMap.java
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/string/LineSeparator.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/ByteBufChecksum.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DatagramPacketDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/string/LineEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/CodecOutputList.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/CompressionUtil.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DateFormatter.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DatagramPacketEncoder.java

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*/

/**

* A decoder that splits the received {@link ByteBuf}s dynamically by the
* value of the length field in the message. It is particularly useful when you
* decode a binary message which has an integer header field that represents the
* length of the message body or the whole message.

* <p>

* {@link LengthFieldBasedFrameDecoder} has many configuration parameters so

* that it can decode any message with a length field, which is often seen in
 * proprietary client-server protocols. Here are some example that will give
 * you the basic idea on which option does what.

*
 * <h3>2 bytes length field at offset 0, do not strip header</h3>

*
 * The value of the length field in this example is <tt>12 (0x0C)</tt> which
 * represents the length of "HELLO, WORLD". By default, the decoder assumes
 * that the length field represents the number of the bytes that follows the
 * length field. Therefore, it can be decoded with the simplistic parameter
 * combination.

```
* <pre>
* <b>lengthFieldOffset</b> = <b>0</b>
* <b>lengthFieldLength</b> = <b>2</b>
* lengthAdjustment = 0
* initialBytesToStrip = 0 (= do not strip header)
```

```
*
* BEFORE DECODE (14 bytes)      AFTER DECODE (14 bytes)
* +-----+-----+ +-----+-----+
* | Length | Actual Content |---->| Length | Actual Content |
* | 0x000C | "HELLO, WORLD" |    | 0x000C | "HELLO, WORLD" |
* +-----+-----+ +-----+-----+
* </pre>
```

*
 * <h3>2 bytes length field at offset 0, strip header</h3>

*
 * Because we can get the length of the content by calling
 * { @link ByteBuf#readableBytes() }, you might want to strip the length
 * field by specifying <tt>initialBytesToStrip</tt>. In this example, we
 * specified <tt>2</tt>, that is same with the length of the length field, to
 * strip the first two bytes.

```
* <pre>
* lengthFieldOffset = 0
* lengthFieldLength = 2
* lengthAdjustment = 0
* <b>initialBytesToStrip</b> = <b>2</b> (= the length of the Length field)
```

```
*
* BEFORE DECODE (14 bytes)      AFTER DECODE (12 bytes)
* +-----+-----+ +-----+
* | Length | Actual Content |---->| Actual Content |
* | 0x000C | "HELLO, WORLD" |    | "HELLO, WORLD" |
* +-----+-----+ +-----+
* </pre>
```

*
 * <h3>2 bytes length field at offset 0, do not strip header, the length field
 * represents the length of the whole message</h3>

*
 * In most cases, the length field represents the length of the message body

* only, as shown in the previous examples. However, in some protocols, the
 * length field represents the length of the whole message, including the
 * message header. In such a case, we specify a non-zero
 * `<tt>lengthAdjustment</tt>`. Because the length value in this example message
 * is always greater than the body length by `<tt>2</tt>`, we specify `<tt>-2</tt>`
 * as `<tt>lengthAdjustment</tt>` for compensation.

```
* <pre>
* lengthFieldOffset = 0
* lengthFieldLength = 2
* <b>lengthAdjustment</b> = <b>-2</b> (= the length of the Length field)
* initialBytesToStrip = 0
*
```

```
* BEFORE DECODE (14 bytes)      AFTER DECODE (14 bytes)
* +-----+-----+-----+-----+
* | Length | Actual Content |---->| Length | Actual Content |
* | 0x000E | "HELLO, WORLD" |   | 0x000E | "HELLO, WORLD" |
* +-----+-----+-----+-----+
```

* `<h3>3 bytes length field at the end of 5 bytes header, do not strip header</h3>`
 *

* The following message is a simple variation of the first example. An extra
 * header value is prepended to the message. `<tt>lengthAdjustment</tt>` is zero
 * again because the decoder always takes the length of the prepended data into
 * account during frame length calculation.

```
* <pre>
* <b>lengthFieldOffset</b> = <b>2</b> (= the length of Header 1)
* <b>lengthFieldLength</b> = <b>3</b>
* lengthAdjustment = 0
* initialBytesToStrip = 0
*
```

```
* BEFORE DECODE (17 bytes)      AFTER DECODE (17 bytes)
* +-----+-----+-----+-----+
* | Header 1 | Length | Actual Content |---->| Header 1 | Length | Actual Content |
* | 0xCAFE | 0x00000C | "HELLO, WORLD" |   | 0xCAFE | 0x00000C | "HELLO, WORLD" |
* +-----+-----+-----+-----+
```

* `<h3>3 bytes length field at the beginning of 5 bytes header, do not strip header</h3>`
 *

* This is an advanced example that shows the case where there is an extra
 * header between the length field and the message body. You have to specify a
 * positive `<tt>lengthAdjustment</tt>` so that the decoder counts the extra
 * header into the frame length calculation.

```
* <pre>
* lengthFieldOffset = 0
* lengthFieldLength = 3
* <b>lengthAdjustment</b> = <b>2</b> (= the length of Header 1)
```

```

* initialBytesToStrip = 0
*
* BEFORE DECODE (17 bytes)          AFTER DECODE (17 bytes)
* +-----+-----+-----+-----+ +-----+-----+-----+-----+
* | Length | Header 1 | Actual Content |---->| Length | Header 1 | Actual Content |
* | 0x00000C | 0xCAFE | "HELLO, WORLD" |    | 0x00000C | 0xCAFE | "HELLO, WORLD" |
* +-----+-----+-----+-----+ +-----+-----+-----+-----+
* </pre>
*
* <h3>2 bytes length field at offset 1 in the middle of 4 bytes header,
* strip the first header field and the length field</h3>
*
* This is a combination of all the examples above. There are the prepended
* header before the length field and the extra header after the length field.
* The prepended header affects the <tt>lengthFieldOffset</tt> and the extra
* header affects the <tt>lengthAdjustment</tt>. We also specified a non-zero
* <tt>initialBytesToStrip</tt> to strip the length field and the prepended
* header from the frame. If you don't want to strip the prepended header, you
* could specify <tt>0</tt> for <tt>initialBytesToSkip</tt>.
* <pre>
* lengthFieldOffset = 1 (= the length of HDR1)
* lengthFieldLength = 2
* <b>lengthAdjustment</b> = <b>1</b> (= the length of HDR2)
* <b>initialBytesToStrip</b> = <b>3</b> (= the length of HDR1 + LEN)
*
* BEFORE DECODE (16 bytes)          AFTER DECODE (13 bytes)
* +-----+-----+-----+-----+ +-----+-----+-----+-----+
* | HDR1 | Length | HDR2 | Actual Content |---->| HDR2 | Actual Content |
* | 0xCA | 0x000C | 0xFE | "HELLO, WORLD" |    | 0xFE | "HELLO, WORLD" |
* +-----+-----+-----+-----+ +-----+-----+-----+-----+
* </pre>
*
* <h3>2 bytes length field at offset 1 in the middle of 4 bytes header,
* strip the first header field and the length field, the length field
* represents the length of the whole message</h3>
*
* Let's give another twist to the previous example. The only difference from
* the previous example is that the length field represents the length of the
* whole message instead of the message body, just like the third example.
* We have to count the length of HDR1 and Length into <tt>lengthAdjustment</tt>.
* Please note that we don't need to take the length of HDR2 into account
* because the length field already includes the whole header length.
* <pre>
* lengthFieldOffset = 1
* lengthFieldLength = 2
* <b>lengthAdjustment</b> = <b>-3</b> (= the length of HDR1 + LEN, negative)
* <b>initialBytesToStrip</b> = <b>3</b>
*

```

```

* BEFORE DECODE (16 bytes)          AFTER DECODE (13 bytes)
* +-----+-----+-----+-----+-----+ +-----+-----+
* | HDR1 | Length | HDR2 | Actual Content |---->| HDR2 | Actual Content |
* | 0xCA | 0x0010 | 0xFE | "HELLO, WORLD" |    | 0xFE | "HELLO, WORLD" |
* +-----+-----+-----+-----+-----+ +-----+-----+
* </pre>
* @see LengthFieldPrepender
*/

```

Found in path(s):

```

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/LengthFieldBasedFrameDecoder.java

```

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*/
/**
* Enumeration of supported Base64 dialects.
* <p>
* The internal lookup tables in this class has been derived from
* <a href="http://iharder.sourceforge.net/current/java/base64/">Robert Harder's Public Domain
* Base64 Encoder/Decoder</a>.
*/

```

Found in path(s):

```

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
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jar/io/netty/handler/codec/DefaultHeadersImpl.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/CharSequenceValueConverter.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ValueConverter.java
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*/

/**

* Utility class for { @link ByteBuf } that encodes and decodes to and from
* [Base64](http://en.wikipedia.org/wiki/Base64) notation.

* <p>

* The encoding and decoding algorithm in this class has been derived from

* [Robert Harder's Public Domain](http://iharder.sourceforge.net/current/java/base64/)

* Base64 Encoder/Decoder.

*/

Found in path(s):

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/base64/Base64.java

1.341 jackson 2.11.2

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1.342 giflib 5.2.1

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1.343 junixsocket-native-common 2.3.2

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```
* /opt/ws_local/PERMITS_SQL/1046144837_1589880123.03/0/junixsocket-native-common-2-3-2-sources-
jar/org/newsclub/lib/junixsocket/common/NarMetadata.java
```

1.344 curl 7.62.0-DEV

1.344.1 Available under license :

License Mixing

=====

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1.345 swagger-annotations 2.1.9

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```
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jar/io/swagger/v3/oas/annotations/servers/Servers.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/media/Encoding.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/callbacks/Callback.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/security/SecuritySchemes.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/info/Info.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/security/SecurityRequirement.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/security/SecurityScheme.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/callbacks/Callbacks.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/headers/Header.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/info/Contact.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/tags/Tag.java
```

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthFlow.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Operation.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Parameter.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/Server.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Parameters.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthFlows.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthScope.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/ServerVariable.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/extensions/Extensions.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/ExampleObject.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/info/License.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/OpenAPIDefinition.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Schema.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/tags/Tags.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecurityRequirements.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/links/Link.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/responses/ApiResponse.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/ExternalDocumentation.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/DiscriminatorMapping.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/responses/ApiResponses.java

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* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Content.java

1.346 syslinux 6.03

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*

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```

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1.353 pcre2 10.34-7

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Written by: Philip Hazel
Email local part: ph10
Email domain: cam.ac.uk

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1.355 dhcp 4.1-ESV-R9

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1.356 curl 7.68.0-1ubuntu2.6

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License Mixing

=====

libcurl can be built to use a fair amount of various third party libraries, libraries that are written and provided by other parties that are distributed using their own licenses. Even libcurl itself contains code that may cause problems to some. This document attempts to describe what licenses libcurl and the other libraries use and what possible dilemmas linking and mixing them all can lead to for end users.

I am not a lawyer and this is not legal advice!

One common dilemma is that [GPL](<https://www.gnu.org/licenses/gpl.html>) licensed code is not allowed to be linked with code licensed under the [Original BSD license](<https://spdx.org/licenses/BSD-4-Clause.html>) (with the announcement clause). You may still build your own copies that use them all, but distributing them as binaries would be to violate the GPL license - unless you accompany your license with an [exception](<https://www.gnu.org/licenses/gpl-faq.html#GPLIncompatibleLibs>). This particular problem was addressed when the [Modified BSD license](<https://opensource.org/licenses/BSD-3-Clause>) was created, which does not have the announcement clause that collides with GPL.

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libssh2

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1.357 spring-security-core 5.3.4.RELEASE

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/parameters/AnnotationParameterNameDiscoverer.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/annotation/AuthenticationPrincipal.java
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 */
/**
```

```
 * Determines if the { @link #getAuthentication() } has permission to access the target
 * given the permission
 * @param target the target domain object to check permission on
 * @param permission the permission to check on the domain object (i.e. "read",
 * "write", etc).
 * @return true if permission is granted to the { @link #getAuthentication() }, else
 * false
 */
```

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```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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```

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- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/DelegatingReactiveAuthenticationManager.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/Transient.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/ReactiveUserDetailsPasswordService.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/MessageDigestPasswordEncoder.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/scheduling/DelegatingSecurityContextTaskScheduler.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authorization/AuthorityReactiveAuthorizationManager.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UnmodifiableListDeserializer.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/provisioning/JdbcUserDetailsManager.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/DefaultMethodSecurityExpressionHandler.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/token/KeyBasedPersistenceTokenService.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/LdapShaPasswordEncoder.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UnmodifiableListMixin.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/concurrent/DelegatingSecurityContextCallable.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/concurrent/DelegatingSecurityContextRunnable.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PrePostAdviceReactiveMethodInterceptor.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/CachingUserDetailsService.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/Md4PasswordEncoder.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/DelegatingPasswordEncoder.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/BadCredentialsExceptionMixin.java
- * /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/Pbkdf2PasswordEncoder.java

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/MethodSecurityEvaluationContext.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/ProviderManager.java
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/**
*
* @param authentication represents the user in question. Should not be null.
* @param targetDomainObject the domain object for which permissions should be
* checked. May be null in which case implementations should return false, as the null
* condition can be checked explicitly in the expression.
* @param permission a representation of the permission object as supplied by the
* expression system. Not null.
* @return true if the permission is granted, false otherwise
*/

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/PermissionEvaluator.java

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/AbstractJaasAuthenticationProvider.java

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/memory/InMemoryConfiguration.java

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authorization/AuthorizationDecision.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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```

jar/org/springframework/security/authentication/ReactiveAuthenticationManager.java
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/password/Md4.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/factory/PasswordEncoderFactories.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/SpringSecurityCoreVersion.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authorization/ReactiveAuthorizationManager.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/AuthenticatedPrincipal.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/parameters/P.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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/**

* Base64 encoder which is a reduced version of Robert Harder's public domain

* implementation (version 2.3.7). See <a

* href="http://i harder.sourceforge.net/current/java/base64/">http://i harder.sourceforge.net/current/java/base64/

for more information.

* <p>

* For internal use only.

*

* @author Luke Taylor

* @since 3.0

* @deprecated Use java.util.Base64

*/

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UserDeserializer.java

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*/

Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/hierarchicalroles/RoleHierarchyUtils.java

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Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/bcrypt/BCryptPasswordEncoder.java

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*/

/**

```

* A token issued by { @link TokenService}.
*
* <p>
* It is important that the keys assigned to tokens are sufficiently randomised and
* secured that they can serve as identifying a unique user session. Implementations of
* { @link TokenService} are free to use encryption or encoding strategies of their choice.
* It is strongly recommended that keys are of sufficient length to balance safety against
* persistence cost. In relation to persistence cost, it is strongly recommended that
* returned keys are small enough for encoding in a cookie.
* </p>
*
* @author Ben Alex
* @since 2.0.1
*/

```

Found in path(s):

```

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/token/Token.java

```

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```

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*/

```

Found in path(s):

```

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/PreInvocationExpressionAttribute.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/method/AbstractFallbackMethodSecurityMetadataSource.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/SimpleGrantedAuthority.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/jaas/event/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/MethodSecurityExpressionRoot.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-

```

jar/org/springframework/security/access/method/P.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/SecurityExpressionRoot.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/InternalAuthenticationServiceException.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PostInvocationAttribute.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PostFilter.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PreInvocationAuthorizationAdviceVoter.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/GrantedAuthoritiesMapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/jaas/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aspectj/AspectJMethodSecurityInterceptor.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/annotation/AnnotationMetadataExtractor.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AccountStatusException.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/MutableUser.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/session/SessionDestroyedEvent.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/concurrent/DelegatingSecurityContextScheduledExecutorService.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aspectj/MethodInvocationAdapter.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/jackson2/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/MappableAttributesRetriever.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/MethodSecurityExpressionOperations.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/AbstractExpressionBasedMethodConfigAttribute.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/MapBasedAttributes2GrantedAuthoritiesMapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/context/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/UserDetailsManager.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-

jar/org/springframework/security/access/prepost/PostAuthorize.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/GrantedAuthoritiesContainer.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/SimpleMappableAttributesRetriever.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/NullAuthoritiesMapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/context/DelegatingApplicationListener.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/AuthorityUtils.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/session/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/ExpressionUtils.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/vote/RoleHierarchyVoter.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PreFilter.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/UserDetailsByNameServiceWrapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PrePostInvocationAttributeFactory.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/concurrent/DelegatingSecurityContextExecutor.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/SimpleAttributes2GrantedAuthoritiesMapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/UserDetailsChecker.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/task/DelegatingSecurityContextAsyncTaskExecutor.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/codec/Utf8.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/event/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/jdbc/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PrePostAnnotationSecurityMetadataSource.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/PermissionCacheOptimizer.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/concurrent/AbstractDelegatingSecurityContextSupport.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/vote/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-

jar/org/springframework/security/core/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/password/AbstractPasswordEncoder.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PostInvocationAdviceProvider.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PreInvocationAuthorizationAdvice.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/GroupManager.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/util/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/cache/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/SecurityExpressionHandler.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/cache/SpringCacheBasedUserCache.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/task/DelegatingSecurityContextTaskExecutor.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/DenyAllPermissionEvaluator.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/method/DelegatingMethodSecurityMetadataSource.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/token/Sha512DigestUtils.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/session/SessionCreationEvent.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/annotation/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/rcp/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/hierarchicalroles/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/InMemoryUserDetailsManager.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/AuthenticationUserDetailsService.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/memory/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/hierarchicalroles/RoleHierarchyAuthoritiesMapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-

jar/org/springframework/security/core/authority/mapping/Attributes2GrantedAuthoritiesMapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/scheduling/DelegatingSecurityContextSchedulingTaskExecutor.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/ExpressionBasedAnnotationAttributeFactory.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/codec/Hex.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/hierarchicalroles/CycleInRoleHierarchyException.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/CredentialsContainer.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AccountStatusUserDetailsChecker.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/token/DefaultToken.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aspectj/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/method/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PreAuthorize.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/jaas/memory/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/parameters/DefaultSecurityParameterNameDiscoverer.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/AbstractSecurityExpressionHandler.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/dao/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PostInvocationAuthorizationAdvice.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AuthenticationEventPublisher.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/codec/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/SimpleAuthorityMapper.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/PostInvocationExpressionAttribute.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/annotation/Jsrf250Voter.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/concurrent/DelegatingSecurityContextExecutorService.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-

jar/org/springframework/security/core/token/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/MutableUserDetails.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/annotation/Js250SecurityConfig.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aopalliance/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/hierarchicalroles/RoleHierarchy.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/hierarchicalroles/NullRoleHierarchy.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/MethodSecurityExpressionHandler.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/event/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PreInvocationAttribute.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/ExpressionBasedPostInvocationAdvice.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/token/TokenService.java
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jar/org/springframework/security/jackson2/UserMixin.java

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-

jar/org/springframework/security/jackson2/UsernamePasswordAuthenticationTokenMixin.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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jar/org/springframework/security/converter/RsaKeyConverters.java  
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jar/org/springframework/security/crypto/argon2/Argon2PasswordEncoder.java  
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-  
jar/org/springframework/security/authentication/ReactiveAuthenticationManagerResolver.java  
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jar/org/springframework/security/core/annotation/CurrentSecurityContext.java  
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jar/org/springframework/security/access/hierarchicalroles/RoleHierarchyImpl.java
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```

*/
/**
* Reviews the Object returned from a secure object invocation, being able to
* modify the Object or throw an { @link AccessDeniedException}.
* <p>
* Typically used to ensure the principal is permitted to access the domain object
* instance returned by a service layer bean. Can also be used to mutate the domain object
* instance so the principal is only able to access authorised bean properties or
* Collection elements.
* <p>
* Special consideration should be given to using an AfterInvocationManager
* on bean methods that modify a database. Typically an
* AfterInvocationManager is used with read-only methods, such as
* public DomainObject getById(id). If used with methods that modify a
* database, a transaction manager should be used to ensure any
* AccessDeniedException will cause a rollback of the changes made by the
* transaction.
* </p>
*
* @author Ben Alex
*/

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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1.358 go 1.13.15

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```
# This is the official list of people who can contribute
# (and typically have contributed) code to the Go repository.
# The AUTHORS file lists the copyright holders; this file
# lists people. For example, Google employees are listed here
# but not in AUTHORS, because Google holds the copyright.
#
# Names should be added to this file only after verifying that
# the individual or the individual's organization has agreed to
# the appropriate Contributor License Agreement, found here:
#
# http://code.google.com/legal/individual-cla-v1.0.html
# http://code.google.com/legal/corporate-cla-v1.0.html
#
# The agreement for individuals can be filled out on the web.
```

```
# Names should be added to this file like so:
# Individual's name <submission email address>
```

Individual's name <submission email address> <email2> <emailN>

An entry with multiple email addresses specifies that the
first address should be used in the submit logs and
that the other addresses should be recognized as the
same person when interacting with Gerrit.

Please keep the list sorted.

Aamir Khan <syst3m.w0rm@gmail.com>
Aaron Cannon <cannona@fireantproductions.com>
Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
Aaron Kemp <kemp.aaron@gmail.com>
Aaron Stein <aaronstein12@gmail.com>
Aaron Torres <tcboox@gmail.com>
Aaron Zinman <aaron@azinman.com>
Aarti Parikh <aarti.parikh@gmail.com>
Abdullah Al Maruf <mymail.maruf@gmail.com>
Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Azarchs <adam.azarchs@10xgenomics.com>
Adam Bender <abender@google.com>
Adam Eijdenberg <adam@continusec.com>
Adam Harvey <aharvey@php.net>
Adam Kisala <adam.kisala@gmail.com>
Adam Langley <agl@golang.org>
Adam Medzinski <adam.medzinski@gmail.com>
Adam Shannon <adamkshannon@gmail.com>
Adam Sindelar <adamsh@google.com>
Adam Thomason <athomason@gmail.com>
Adam Woodbeck <adam@woodbeck.net>
Adarsh Ravichandran <adarshravichandran91@gmail.com>
Aditya Mukerjee <dev@chimeracoder.net>
Adrian Hesketh <adrianhesketh@hushmail.com>
Adrian Nos <nos.adrian@gmail.com>
Adrian O'Grady <elpollouk@gmail.com>
Adrien Bustany <adrien-xx-google@bustany.org>
Adrien Petel <peteladrien@gmail.com>
Acio Jnior <aeciodantasjunior@gmail.com>
Aeneas Rekkas (arekkas) <aeneas@ory.am>
Afanasev Stanislav <phpprogger@gmail.com>
Agis Anastasopoulos <agis.anast@gmail.com>
Agniva De Sarker <agnivade@yahoo.co.in>
Ahmed Wahed <oneofone@gmail.com>
Ahmet Alp Balkan <ahmethb@google.com>
Ahmet Soormally <ahmet@mangomm.co.uk>
Ahmy Yulrizka <yulrizka@gmail.com>

Ahsun Ahmed <ahmed.ahsun@gmail.com>
Aiden Scandella <ai@uber.com>
Ainar Garipov <gugl.zadolbal@gmail.com>
Aishraj Dahal <aishraj@users.noreply.github.com>
Akhil Indurti <contact@akhilindurti.com>
Akihiro Suda <suda.kyoto@gmail.com>
Akshat Kumar <seed@mail.nanosouffle.net>
Al Cutter <al@google.com>
Alan Braithwaite <alan@ipaddr.org>
Alan Donovan <adonovan@google.com>
Alan Shreve <alan@inconshreveable.com>
Albert Nigmatzianov <albertnigma@gmail.com>
Albert Strasheim <fullung@gmail.com>
Albert Teoh <albert.teoh@gmail.com>
Albert Yu <yukinying@gmail.com>
Alberto Bertogli <albertito@blitiri.com.ar>
Alberto Donizetti <alb.donizetti@gmail.com>
Alberto Garca Hierro <alberto@garciahierro.com> <alberto.garcia.hierro@gmail.com>
Aleksa Sarai <cyphar@cyphar.com>
Aleksandar Dezelin <dezelin@gmail.com>
Aleksandr Lukinykh <a.lukinykh@xsolla.com>
Aleksandr Razumov <ar@cydev.ru>
Alekseev Artem <a.artem060@gmail.com>
Alessandro Arzilli <alessandro.arzilli@gmail.com>
Alessandro Baffa <alessandro.baffa@gmail.com>
Alex A Skinner <alex@lx.lc>
Alex Brainman <alex.brainman@gmail.com>
Alex Bramley <abramley@google.com>
Alex Browne <stephenalexbrowne@gmail.com>
Alex Carol <alex.carol.c@gmail.com>
Alex Jin <toalexjin@gmail.com>
Alex Kohler <alexjohnkohler@gmail.com>
Alex Myasoedov <msoedov@gmail.com>
Alex Plugaru <alex@plugaru.org> <alexandru.plugaru@gmail.com>
Alex Schroeder <alex@gnu.org>
Alex Sergeyev <abc@alexsergeyev.com>
Alex Tokarev <aleksator@gmail.com>
Alex Vaghin <crhyme@google.com>
Alexander Demakin <alexander.demakin@gmail.com>
Alexander Dring <email@alex.d.ch>
Alexander F Rdseth <alexander.rodseth@appeartv.com>
Alexander Guz <kalimatas@gmail.com>
Alexander Kauer <alexander@affine.space>
Alexander Kucherenko <alxkchr@gmail.com>
Alexander Larsson <alexander.larsson@gmail.com>
Alexander Lourier <aml@rulezz.ru>
Alexander Menzhinsky <amenzhinsky@gmail.com>
Alexander Morozov <lk4d4math@gmail.com>

Alexander Neumann <alexander@bumper.de>
Alexander Orlov <alexander.orlov@loxal.net>
Alexander Pantyukhin <apantykhin@gmail.com>
Alexander Polcyn <apolcyn@google.com>
Alexander Rakoczy <alex@golang.org>
Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zillion <alex@alexzillion.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandre Cesaro <alexandre.cesaro@gmail.com>
Alexandre Fiori <fiorix@gmail.com>
Alexandre Maari <draeron@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandre Parentea <aubonbeurre@gmail.com>
Alexandre Viau <alexandre@alexandreviau.net>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Alexandrov <aalexand@google.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Naidonov <alexey.naidyonov@gmail.com>
Alexey Neganov <neganovalexey@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexis Hildebrandt <surryhill@gmail.com>
Alexis Hunt <lexer@google.com>
Alexis Imperial-Legrand <ail@google.com>
Ali Rizvi-Santiago <arizvisa@gmail.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>
Allen Li <ayatane@google.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Aman Gupta <aman@tmm1.net>
Amir Mohammad Saied <amir@gluegadget.com>
Amr Mohammed <merodiro@gmail.com>
Amrut Joshi <amrut.joshi@gmail.com>
Anand K. Mistry <anand@mistry.ninja>
Anders Pearson <anders@columbia.edu>
Anderson Queiroz <contato@andersonq.eti.br>
Andr Carvalho <asantostc@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Nodari <andrea.nodari91@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>

Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Lutomirski <andy@luto.us>
Andrew Pilloud <andrewpilloud@igneoussystem.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>
Andrew Wilkins <axwalk@gmail.com>
Andrew Williams <williams.andrew@gmail.com>
Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
Andrii Soluk <isoluchok@gmail.com>
Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Walker <walkeraj@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>

Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Anschel Schaffer-Cohen <anschelsc@gmail.com>
Anthony Alves <cvballa3g0@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <ality@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>
Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>
Anton Gyllenberg <anton@iki.fi>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>
Antonio Bibiano <antbbn@gmail.com>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>
Arash Bina <arash@arash.io>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmanni <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>

awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayanamist Yang <ayanamist@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>
Baokun Lee <nototon@gmail.com>
Bartosz Grzybowski <melkorm@gmail.com>
Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>
Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbharath91@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>
Bill Zissimopoulos <billziss@navimatics.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>

Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradley Falzon <brad@teambrod.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Ryan <bjryan19@gmail.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkennedy@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Bryan Heden <b.heden@gmail.com>
Bulat Gaifullin <gaifullinbf@gmail.com>
Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>

Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlisia Campos <carlisia@grokkingtech.io>
Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlosedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Souza <carloshrsouza@gmail.com>
Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Channing Kimble-Brown <channing@golang.org>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Cherry Zhang <cherryz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>
Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>
Chris Manghane <cmang@golang.org>
Chris Marchesi <chrism@vanclueverttech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>

Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clment Chigot <clement.chigot@atos.net>
Clement Skau <clementskau@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>
Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Conrado Gouvea <conradopl@gmail.com>
Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Cosmos Nicolaou <nicolaou@google.com>
Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrill@schumacher.fm>

Daisuke Fujita <dtanshi45@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damien.lespiau@gmail.com> <damien.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damien@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruzalek@gmail.com>
Danny Rosseau <daniel.rosseau@gmail.com>
Daria Kolistratova <daria.kolistratova@intel.com>
Darien Raymond <admin@v2ray.com>
Darren Elwood <darren@textnode.com>
Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>

Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>
David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>
David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>
David Wimmer <davidlwimmer@gmail.com>
Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>

Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvdudd Jadhav <dhrvdudd.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>
Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Domen Ipavec <domen@ipavec.net>
Dominic Green <dominicgreen1@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>

Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>
Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliek <efliek@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>
Emerson Lin <linyintor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rykwaldler <e.rykwaldler@gmail.com>
Erik Aigner <aigner.erik@gmail.com>

Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Eugene Kalinin <e.v.kalinin@gmail.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Polyakov <zbr@ioremap.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youremail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Fedor Korotkiy <dartslon@gmail.com>
Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Filip Gruszczyski <gruszczyski@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>

Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>
Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>
Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>
Francisco Souza <franciscossouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Frederik Ring <frederik.ring@gmail.com>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@gaurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Gauthier Jolly <gauthier.jolly@gmail.com>
Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>

George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>
Gernot Vormayr <gvormayr@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>
GitHub User @ajnrp (1688456) <ajnrp@users.noreply.github.com>
GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @frenkie (6499251) <mail@rhab.de>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @kazysshr (30496953) <kazysshr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @madiganz (18340029) <zacharywmadigan@gmail.com>
GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @OlgaVlPetrova (44112727) <OVPPetrova@gmail.com>
GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Choroma194@gmail.com>
GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>
GitHub User @tell-k (26263) <ffk2005@gmail.com>
GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <53217283+utkarsh-extc@users.noreply.github.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>

Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gnezdo+github@google.com>
Greg Thelen <gthelen@google.com>
Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmest.net>
Guobiao Mei <meiguobiao@gmail.com>
Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>
Han-Wen Nienhuys <hanwen@google.com>
Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>

Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdt@gmail.com>
Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hongfei Tan <feilengcui008@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>
Igor Bernstein <igorbernstein@google.com>
Igor Dolzhikov <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Ilya Yalovyy <yalovoy@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>

Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>
Ivan Bertona <ivan.bertona@gmail.com>
Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>
Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchii <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>
James David Chalfant <james.chalfant@gmail.com>
James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jljatone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>

James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jamiliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>
Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnml@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Culp <jculp14@gmail.com>
Jaroslav Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>
Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weisskopf <jay@jayschwa.net>

Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>
Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>
Jimmy Frasche <soapboxcicero@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londdevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>

Jiulong Wang <jiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>
Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>
Joe Shaw <joe@joeshaw.org>
Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
John Weldon <johnweldon4@gmail.com>
Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jonas Bernoulli <jonas@bernoul.li>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>
Jonathan Feinberg <feinberg@google.com>

Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kieft <ikojba@gmail.com> <joop@kiefte.net>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jos Visser <josv@google.com>
Jose Luis Vazquez Gonzalez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhau <js@solidssystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
JT Olio <hello@jtolio.com>
Juan Carlos <juanjcsr@gmail.com>
Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>

Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>
Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kelly Heller <pestophagous@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmiller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katie Hockman <katie@golang.org>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>

Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>
Kirill Smelkov <kirr@nexedi.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitijgaraogi@gmail.com>
Kun Li <likunarmstrong@gmail.com>
Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>

Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Kyrylo Silin <silin@kyrylo.org>
L Campbell <unpantsu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lanm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>
Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>
Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Lion Yang <lion@aosc.xyz>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>
Luca Greco <luca.greco@alcacoop.it>
Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>

Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>
Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>
Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>
Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Willock <crazcalm@gmail.com>
Marga Manterola <marga@google.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>
Marius Nuennerich <mnu@google.com>
Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>

Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>
Martin Kunc <martinkunc@users.noreply.github.com>
Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>
Mt Gulys <mgulyas86@gmail.com>
Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>

Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mdbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>
Matt Layher <mdllyher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdin.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>
Maya Rashish <maya@NetBSD.org>
Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszek <mknyszek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>

Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorf.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>
Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufl <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgrber <mteichgraber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <ziutek@inet.pl>
Michal Franc <lam.michal.franc@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>

Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>
Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mike Tsao <mike@sowbug.com>
Mike Wiacek <mjwiacek@google.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mostyn Bramley-Moore <mostyn@antipode.se>
Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Nan Deng <monnand@gmail.com>
Nao Yonashiro <owan.orisano@gmail.com>

Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>
Nathan Caza <mastercactapus@gmail.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otternes@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Kryuchkov <nkryuchkov10@gmail.com>

Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nils Larsgrd <nilsmagnus@gmail.com>
Nir Soffer <nirsof@gmail.com>
Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>
Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogsoft.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryanmoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorpus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>
Pascal Dierich <pascal@pascaldierich.com>
Pascal S. de Kloe <pascal@quies.net>
Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>

Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>
Peter Dotchev <dotchev@gmail.com>
Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>

Peter Nguyen <peter@mictis.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>
Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.brgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@hellopiers.pro>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Pontus Leitzler <leitzler@gmail.com>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Varanasi <prashant@prashantv.com>
Pravendra Singh <hackpravj@gmail.com>
Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quinn Slack <sqs@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>

Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>
Ricardo Padilha <ricardospadilha@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saarelm <rsaarelm@gmail.com>
Rob Earhart <earhart@google.com>
Rob Norman <rob.norman@infinitycloud.com>
Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>

Robert Iannucci <iannucci@google.com>
Robert Obryk <robryk@gmail.com>
Robert Seseek <rseseek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Rodolfo Carvalho <rhcarvalho@gmail.com>
Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Verma <rohanverma2004@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bauge <romain.bauge@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Shchekin <mrqtros@gmail.com>
Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <ruiiu@google.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribrdb@google.com>
Ryan Canty <jrcanty@gmail.com>
Ryan Dahl <ry@tinyclouds.org>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>

Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Sakeven Jiang <jc5930@sina.cn>
Salmn Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>
Sam Boyer <tech@samboyer.org>
Sam Ding <samding@ca.ibm.com>
Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>
Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediaruna.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>

Seiji Takahashi <timaki.st@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'Snake' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>
Sergey Semin <gray12511@gmail.com>
Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shaozhen Ding <dsz0111@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <selliot@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zs950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simon Jefford <simon.jefford@gmail.com>
Simon Rawet <simon@rawet.se>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Spencer Nelson <s@spenczar.com>
Spencer Tung <spencertung@google.com>

Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Renatus <srenatus@chef.io>
Stephan Zuercher <zuercher@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimistev@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littiebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>
Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>
Sunny <me@darkowlzz.space>
Suriyaa Sundararuban <suriyaasundararuban@gmail.com>
Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sylvain Zimmer <sylvain@sylvainzimmer.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>

Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddotx.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>
Thomas Kappler <tkappler@gmail.com>
Thomas Meson <zllak@hycik.org>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>

Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubeii@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>
Timothy Studd <tim@timestudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>
Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Payne <twpayne@gmail.com>
Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>
Tonis Tiigi <tonistiigi@gmail.com>
Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Tormod Erevik Lea <tormodlea@gmail.com>
Toshihiro Shiino <shiino.toshihiro@gmail.com>
Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>

Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Ooohry <ooohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangjparmar@gmail.com>
Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>
Viacheslav Poturaev <vearutop@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>
Visweswara R <r.visweswara@gmail.com>
Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>

Vladimir Varankin <nek.narqo@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgriffel@gmail.com>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Warren Fernandes <warren.f.fernandes@gmail.com>
Wayne Ashley Berry <wayneashleyberry@gmail.com>
Wedson Almeida Filho <wedsonaf@google.com>
Weerasak Chongnguluam <singpor@gmail.com>
Wi Cngru <crvv.mail@gmail.com>
Wei Fu <fhfuwei@163.com>
Wei Guangjing <vcc.163@gmail.com>
Wei Xiao <wei.xiao@arm.com>
Wei Xikai <xykwei@gmail.com>
Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>
Wil Selwood <wselwood@gmail.com>
Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xing Xing <mikespook@gmail.com>
Xu Fei <badgangkiller@gmail.com>
Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherve@gmail.com>

Yann Salan <yannsalaun1@gmail.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yasha Bubnov <girokompass@gmail.com>
Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>
Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <ylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>
Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>
Yorman Arias <cixtords@gmail.com>
Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>
Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
Yukihiro Nishinaka <6elpinal@gmail.com>
Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zach Bintliff <zbintliff@gmail.com>
Zach Gershman <zachgersh@gmail.com>
Zach Jones <zachj1@gmail.com>
Zachary Amsden <zach@thundertoken.com>
Zachary Gershman <zgershman@pivotal.io>
Zak <zrjknill@gmail.com>
Zakatell Kanda <hi@zkanda.io>
Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>
Zev Goldstein <zev.goldstein@gmail.com>
Zheng Dayu <davidzheng23@gmail.com>
Zheng Xu <zheng.xu@arm.com>
Zhengyu He <hzy@google.com>
Zhongpeng Lin <zplin@uber.com>
Zhongtao Chen <chenzhongtao@126.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Zhou Peng <p@ctruple.cn>
Ziad Hatahet <hatahet@gmail.com>

Zorion Arrizabalaga <zorionk@gmail.com>

<a.maksadbek@gmail.com>

<max.faceless.frei@gmail.com>

<hagen1778@gmail.com>

<tbunyk@gmail.com>

<faxriddinjon@gmail.com>

<zs349596@gmail.com>

<bronze1man@gmail.com>

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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/util/ExceptionUtils.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-

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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-

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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-

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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/logging/javautil/JavaUtilLog.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-jar/org/flywaydb/core/package-
info.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/command/DbRepair.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/database/firebird/FirebirdParser.java
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jar/org/flywaydb/core/internal/parser/Parser.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/jdbc/PlainExecutionTemplate.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/info/MigrationInfoDumper.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-

jar/org/flywaydb/core/internal/resource/ResourceName.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/database/mysql/MySQLDatabase.java
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jar/org/flywaydb/core/internal/database/base/Type.java
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1.361 commons-collections 4.4

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Here is a list of the main contributors to lm-sensors version 3.

- * Frodo Looijaard
Original author of libsensors, sensors-detect, sensors and isadump.
- * Merlin Hughes
Original author of sensord.
- * Bob Schlaermann
Dynamic chip feature detection (a.k.a. generic chip support) in libsensors and sensors.
- * Mark M. Hoffman
Many improvements to the libsensors configuration file scanner.
- * Jean Delvare
New libsensors API, and migration of sensors and sensord thereto.
Many optimizations in libsensors and sensors.
Configuration file converter.
Rewrite of sensors-detect.
Support for multiple configuration files in libsensors.

1.364 audit 2.8.5-2ubuntu6

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To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the program's name and a brief idea of what it does.>  
Copyright (C) <year> <name of author>
```

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this

when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
```

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

1.365 go 1.15.13

1.365.1 Available under license :

```
# This is the official list of people who can contribute
# (and typically have contributed) code to the Go repository.
# The AUTHORS file lists the copyright holders; this file
# lists people. For example, Google employees are listed here
# but not in AUTHORS, because Google holds the copyright.
#
# Names should be added to this file only after verifying that
# the individual or the individual's organization has agreed to
# the appropriate Contributor License Agreement, found here:
#
# http://code.google.com/legal/individual-cla-v1.0.html
# http://code.google.com/legal/corporate-cla-v1.0.html
#
# The agreement for individuals can be filled out on the web.

# Names should be added to this file like so:
```

Individual's name <submission email address>
Individual's name <submission email address> <email2> <emailN>

An entry with multiple email addresses specifies that the
first address should be used in the submit logs and
that the other addresses should be recognized as the
same person when interacting with Gerrit.

Please keep the list sorted.

Aamir Khan <syst3m.w0rm@gmail.com>
Aaron Beitch <aaronb@arista.com>
Aaron Bieber <deftly@gmail.com>
Aaron Cannon <cannona@fireantproductions.com>
Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
Aaron Kemp <kemp.aaron@gmail.com>
Aaron Patterson <tenderlove@ruby-lang.org>
Aaron Stein <aaronstein12@gmail.com>
Aaron Torres <tcboox@gmail.com>
Aaron Zinman <aaron@azinman.com>
Aarti Parikh <aarti.parikh@gmail.com>
Abdullah Al Maruf <mymail.maruf@gmail.com>
Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Azarchs <adam.azarchs@10xgenomics.com>
Adam Bender <abender@google.com>
Adam Eijdenberg <adam@continusec.com>
Adam Harvey <aharvey@php.net>
Adam Kisala <adam.kisala@gmail.com>
Adam Langley <agl@golang.org>
Adam Medzinski <adam.medzinski@gmail.com>
Adam Shannon <adamkshannon@gmail.com>
Adam Shelton <aashelt90@gmail.com>
Adam Sindelar <adamsh@google.com>
Adam Thomason <athomason@gmail.com>
Adam Williams <pwnfactory@gmail.com>
Adam Woodbeck <adam@woodbeck.net>
Adarsh Ravichandran <adarshravichandran91@gmail.com>
Aditya Harindar <aditya.harindar@gmail.com>
Aditya Mukerjee <dev@chimeracoder.net>
Adrian Hesketh <adrianhesketh@hushmail.com>
Adrian Nos <nos.adrian@gmail.com>
Adrian O'Grady <elpollouk@gmail.com>
Adrien Bustany <adrien-xx-google@bustany.org>
Adrien Delorme <adrien.delorme@icloud.com>
Adrien Petel <peteladrien@gmail.com>
Acio Jnior <aeciodantasjunior@gmail.com>

Aeneas Rekkas (arekkas) <aeneas@ory.am>
Afanasev Stanislav <phpprogger@gmail.com>
Agis Anastasopoulos <agis.anast@gmail.com>
Agniva De Sarker <agnivade@yahoo.co.in>
Ahmed Wahed <oneofone@gmail.com>
Ahmet Alp Balkan <ahmetb@google.com>
Ahmet Soormally <ahmet@mangomm.co.uk>
Ahmy Yulrizka <yulrizka@gmail.com>
Ahsun Ahmed <ahmed.ahsun@gmail.com>
Aiden Scandella <ai@uber.com>
Ainar Garipov <gugl.zadolbal@gmail.com>
Aishraj Dahal <aishraj@users.noreply.github.com>
Akhil Indurti <aindurti@gmail.com>
Akihiro Suda <suda.kyoto@gmail.com>
Akshat Kumar <seed@mail.nanosouffle.net>
Al Cutter <al@google.com>
Alan Braithwaite <alan@ipaddr.org>
Alan Donovan <adonovan@google.com>
Alan Shreve <alan@inconshreveable.com>
Albert Nigmatzianov <albertnigma@gmail.com>
Albert Strasheim <fullung@gmail.com>
Albert Teoh <albert.teoh@gmail.com>
Albert Yu <yukinying@gmail.com>
Alberto Bertogli <albertito@blitiri.com.ar>
Alberto Donizetti <alb.donizetti@gmail.com>
Alberto Garca Hierro <alberto@garciahierro.com> <alberto.garcia.hierro@gmail.com>
Alec Benzer <alec.benzer@gmail.com>
Aleksa Sarai <cyphar@cyphar.com>
Aleksandar Dezelin <dezelin@gmail.com>
Aleksandr Lukinykh <a.lukinykh@xsolla.com>
Aleksandr Razumov <ar@cydev.ru>
Alekseev Artem <a.artem060@gmail.com>
Alessandro Arzilli <alessandro.arzilli@gmail.com>
Alessandro Baffa <alessandro.baffa@gmail.com>
Alex A Skinner <alex@lx.lc>
Alex Brainman <alex.brainman@gmail.com>
Alex Bramley <abramley@google.com>
Alex Browne <stephenalexbrowne@gmail.com>
Alex Buchanan <buchanae@gmail.com>
Alex Carol <alex.carol.c@gmail.com>
Alex Gaynor <alex@alloy.us>
Alex Harford <alex.harford@saucelabs.com>
Alex Jin <toalexjin@gmail.com>
Alex Kohler <alexjohnkohler@gmail.com>
Alex Myasoedov <msoedov@gmail.com>
Alex Plugaru <alex@plugaru.org> <alexandru.plugaru@gmail.com>
Alex Schroeder <alex@gnu.org>
Alex Sergeyev <abc@alexsergeyev.com>

Alex Tokarev <aleksator@gmail.com>
Alex Vaghin <crhyme@google.com>
Alex Zhirov <azhirov@google.com>
Alexander Demakin <alexander.demakin@gmail.com>
Alexander Dring <email@alex.d.ch>
Alexander F Rdseth <alexander.rodseth@appeartv.com>
Alexander Greim <alexxx@iltempo.de>
Alexander Guz <kalimatas@gmail.com>
Alexander Kauer <alexander@affine.space>
Alexander Kucherenko <alxkchr@gmail.com>
Alexander Larsson <alexander.larsson@gmail.com>
Alexander Lourier <aml@rulezz.ru>
Alexander Menzhinsky <amenzhinsky@gmail.com>
Alexander Morozov <lk4d4math@gmail.com>
Alexander Neumann <alexander@bumper.de>
Alexander Nohe <alex.nohe427@gmail.com>
Alexander Orlov <alexander.orlov@loxal.net>
Alexander Pantyukhin <apantykhin@gmail.com>
Alexander Polcyn <apolcyn@google.com>
Alexander Rakoczy <alex@golang.org>
Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zillion <alex@alexzillion.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandr Mayorskiy <a.mayorskiy@corp.mail.ru>
Alexandre Cesaro <alexandre.cesaro@gmail.com>
Alexandre Fiori <fiorix@gmail.com>
Alexandre Maari <draeron@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandre Parentea <aubonbeurre@gmail.com>
Alexandre Viau <alexandre@alexandreviau.net>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Alexandrov <aalexand@google.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Naidonov <alexey.naidyonov@gmail.com>
Alexey Neganov <neganovalexey@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexey Semenyuk <alexsemenyuk88@gmail.com>
Alexis Hildebrandt <surryhill@gmail.com>
Alexis Hunt <lexer@google.com>
Alexis Imperial-Legrand <ail@google.com>
Ali Farooq <ali.farooq0@pm.me>
Ali Rizvi-Santiago <arizvisa@gmail.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>

Allen Li <ayatane@google.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Aman Gupta <aman@tmm1.net>
Amarjeet Anand <amarjeetanandsingh@gmail.com>
Amir Mohammad Saied <amir@gluegadget.com>
Amr Mohammed <merodiro@gmail.com>
Amrut Joshi <amrut.joshi@gmail.com>
An Long <aisk1988@gmail.com>
An Xiao <hac@zju.edu.cn>
Anand K. Mistry <anand@mistry.ninja>
Anders Pearson <anders@columbia.edu>
Anderson Queiroz <contato@andersonq.eti.br>
Andr Carvalho <asantostc@gmail.com>
Andr Martins <aanm90@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Nodari <andrea.nodari91@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Enshin <b1os@bk.ru>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew G. Morgan <agm@google.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Louis <alouis@digitalocean.com>
Andrew Lutomirski <andy@luto.us>
Andrew Medvedev <andrew.y.medvedev@gmail.com>
Andrew Pilloud <andrewpilloud@igneoussystem.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>

Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stormont <astormont@racktopsystems.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>
Andrew Wilkins <axwalk@gmail.com>
Andrew Williams <williams.andrew@gmail.com>
Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
Andrii Soluk <isoluchok@gmail.com>
Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Pan <panjf2000@gmail.com>
Andy Walker <walkeraj@gmail.com>
Andy Wang <cbeuw.andy@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>
Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Annirudh Prasad <annirudh@wandb.com>
Anschel Schaffer-Cohen <anschelsc@gmail.com>
Anthony Alves <cvballa3g0@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <alidity@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>
Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>
Anton Gyllenberg <anton@iki.fi>
Anton Kuklin <anton.a.kuklin@gmail.com>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>

Antonio Bibiano <antbbn@gmail.com>
Antonio Huete Jimenez <tuxillo@quantumachine.net>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Anze Kolar <me@akolar.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>
Araragi Hokuto <kanseihonbucho@protonmail.com>
Arash Bina <arash@arash.io>
Arda Gl <ardaguclu@gmail.com>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Alekseev <artem.alekseev@intel.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmani <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Aurlio A. Heckert <aurium@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>
awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayan George <ayan@ayan.net>
Ayanamist Yang <ayanamist@gmail.com>
Ayke van Laethem <aykevanlaethem@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>

Baokun Lee <nototon@gmail.com>
Barnaby Keene <accounts@southcla.ws>
Bartosz Grzybowski <melkorm@gmail.com>
Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>
Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Ben Toews <mastahyeti@gmail.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benjamin Wuethrich <benjamin.wuethrich@gmail.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbharath91@gmail.com>
Bhavin Gandhi <bhavin7392@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>
Bill Zissimopoulos <billziss@navimatics.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Billy Zaelani Malik <m.billyzaelani@gmail.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>
Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob McNaughton <bobmcn@gmail.com>

Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boqin Qin <bobbqqin@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>
Brad Erickson <bderickson@gmail.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradford Lamson-Scribner <brad.lamson@gmail.com>
Bradley Falzon <brad@teambrod.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Philips <brandon@ifup.org>
Brandon Ryan <bjryan19@gmail.com>
Brayden Cloud <bcloud@google.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian Falk <falk@logicparty.org>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkenedy@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Bryan Heden <b.heden@gmail.com>
Bulat Gaifullin <gaifullinbf@gmail.com>
Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>

Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlisia Campos <carlisia@grokkingtech.io>
Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Amedee <carlos@golang.org>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlosedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Iriarte <ciriarte@gmail.com>
Carlos Souza <carloshrsouza@gmail.com>
Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynnon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Changkun Ou <hi@changkun.us>
Channing Kimble-Brown <channing@golang.org>
Chao Xu <xuchao@google.com>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Chauncy Cullitan <chauncyc@google.com>
Chen Zhihan <energiehund@gmail.com>
Cherry Zhang <cherryyz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>

Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Le Roy <brompwnie@users.noreply.github.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>
Chris Manghane <cmang@golang.org>
Chris Marchesi <chrism@vanclueverttech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Loessl <cloessl+github@gmail.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clement Chigot <clement.chigot@atos.net>
Clement Skau <clementskau@gmail.com>
Clint J. Edwards <clint.j.edwards@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>

Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Conrado Gouvea <conradopl@gmail.com>
Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Corne van der Plas <vdplas@gmail.com>
Cosmos Nicolaou <cnicolaou@google.com>
Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrill@schumacher.fm>
Daisuke Fujita <dtanshi45@gmail.com>
Daisuke Suzuki <daisuzu@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damien.lespiau@gmail.com> <damien.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damiem@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Scales <danscales@google.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Kumor <rdkumor@gmail.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mangum <georgedanielmangum@gmail.com>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>

Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruzalek@gmail.com>
Danish Dua <danishdua@google.com>
Danish Prakash <grafitykoncept@gmail.com>
Danny Rosseau <daniel.rosseau@gmail.com>
Daria Kolistratova <daria.kolistratova@intel.com>
Darien Raymond <admin@v2ray.com>
Darren Elwood <darren@textnode.com>
Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Bond <davidsbond93@gmail.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Carter <fresco.raja@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Golden <david@autoprismatic.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>

David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>
David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>
David Wimmer <davidlwimmer@gmail.com>
Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Eigenmann <7621705+decanus@users.noreply.github.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Isaev <idenx@yandex.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>
Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvdudd Jadhav <dhruvdudd.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>
Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>

Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Doga Fincan <doga@icloud.com>
Domas Tamauskas <puerdomus@gmail.com>
Domen Ipavec <domen@ipavec.net>
Dominic Green <dominicgreen1@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>
Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duco van Amstel <duco.vanamstel@gmail.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>
Ed Schouten <ed@nuxi.nl>
Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>
Eduardo Villaseor <evillasrmx@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>

Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliek <efliek@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>
Ellison Leao <ellisonleao@gmail.com>
Emerson Lin <linyintor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Emreacan Bati <emreacanbati@gmail.com>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Biggers <ebiggers@google.com>
Eric Brown <browne@vmware.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rutherford <erutherford@gmail.com>
Eric Rykwalder <e.rykwalder@gmail.com>
Erick Tryzelaar <etryzelaar@google.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Eugene Formanenko <mo4islona@gmail.com>
Eugene Kalinin <e.v.kalinin@gmail.com>

Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Kulikov <tuxuls@gmail.com>
Evgeniy Polyakov <zbr@ioremapi.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youreemail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Fedor Korotkiy <dartslon@gmail.com>
Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Cornelius <9767036+fcornelius@users.noreply.github.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Ferenc Szabo <frncmx@gmail.com>
Filip Gruszczyski <gruszczyski@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>
Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>

Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>
Francisco Souza <francissouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Frederik Ring <frederik.ring@gmail.com>
Frederik Zipp <fzipp@gmx.de>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfritjhof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fujimoto Kyosuke <kyoro.f@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Rosenhouse <rosenhouse@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@gaurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Gauthier Jolly <gauthier.jolly@gmail.com>
Gawen Arab <gawen.arab@c.zen.ly>
Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>
George Hartzell <hartzell@alerce.com>
George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>

Gernot Vormayr <gvormayr@gmail.com>
Gert Cuykens <gert.cuykens@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Ghazni Nattarshah <ghazni.nattarshah@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>
GitHub User @aca (50316549) <acadx0@gmail.com>
GitHub User @ajnrp (1688456) <ajnrp@users.noreply.github.com>
GitHub User @ajz01 (4744634) <ajzdenek@gmail.com>
GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andig (184815) <cpuidle@gmx.de>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chainhelen (7046329) <chainhelen@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @cncal (23520240) <flycalvin@qq.com>
GitHub User @DQNEO (188741) <dqneoo@gmail.com>
GitHub User @Dreamacro (8615343) <chuainian@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @fatedier (7346661) <fatedier@gmail.com>
GitHub User @frenkie (6499251) <mail@rhab.de>
GitHub User @geedchin (11672310) <geedchin@gmail.com>
GitHub User @GrigoriyMikhalkin (3637857) <grigoriymikhalkin@gmail.com>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @jinmiaoluo (39730824) <jinmiaoluo@icloud.com>
GitHub User @jobpbrown (6345470) <msshane2008@gmail.com>
GitHub User @kazysshr (30496953) <kazysshr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @ly303550688 (11519839) <yang.liu636@gmail.com>
GitHub User @madiganz (18340029) <zacharywmadigan@gmail.com>
GitHub User @maltalex (10195391) <code@bit48.net>
GitHub User @Matt966 (28551465) <Matt966@users.noreply.github.com>
GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @nu50218 (40682920) <nu_ll@icloud.com>
GitHub User @OlgaVlPetrova (44112727) <OVPPetrova@gmail.com>

GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @po3rin (29445112) <abctail30@gmail.com>
GitHub User @pokutuna (57545) <popopopokutuna@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @ramenjuniti (32011829) <ramenjuniti@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Choroma194@gmail.com>
GitHub User @skanehira (7888591) <sho19921005@gmail.com>
GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>
GitHub User @tell-k (26263) <ffk2005@gmail.com>
GitHub User @tennashi (10219626) <tennashio@gmail.com>
GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <utkarsh.extc@gmail.com>
GitHub User @witchard (4994659) <witchard@hotmail.co.uk>
GitHub User @yah01 (12216890) <kagaminehuan@gmail.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @zikaeroh (48577114) <zikaeroh@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gnezdo+github@google.com>
Greg Thelen <gthelen@google.com>
Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Gregory Petrosyan <gregory.petrosyan@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmes.net>
Gnther Noack <gnoack@google.com>
Guobiao Mei <meiguobiao@gmail.com>
Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>

Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>
Han-Wen Nienhuys <hanwen@google.com>
Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hasit Bhatt <hasit.p.bhatt@gmail.com>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdt@gmail.com>
Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hiromichi Ema <ema.hiro@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hongfei Tan <feilengcui008@gmail.com>
Horacio Duran <horacio.duran@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>

Howard Zhang <howard.zhang@arm.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Huan Du <i@huandu.me>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Hyoyoung Chang <hyoyoung@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>
Ignacio Hagopian <jsign.uy@gmail.com>
Igor Bernstein <igorbernstein@google.com>
Igor Dolzhevikov <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Illya Yalovyy <yalovoy@gmail.com>
Ilya Sinelnikov <sidhmangh@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irbe Krumina <irbekrm@gmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Isfan Azhabil <isfanazhabil@gmail.com>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>
Ivan Bertona <ivan.bertona@gmail.com>
Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>

Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchii <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Trubach <mr.trubach@icloud.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jaap Aarts <jaap.aarts1@gmail.com>
Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Kaczmarzyk <jakubk@mit.edu>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
Jamal Carvalho <jamal.a.carvalho@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>
James David Chalfant <james.chalfant@gmail.com>
James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jljatone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>
James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>

Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jamieliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>
Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnml@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Allard <jaredallard@users.noreply.github.com>
Jared Culp <jculp14@gmail.com>
Jaroslavas Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Baker <jason-baker@users.noreply.github.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>
Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weisskopf <jay@jayschwa.net>
Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jdrzej Szczepaniak <jbszczepaniak@gmail.com>

Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>
Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Faller <jeremy@golang.org>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jia Zhan <jzhan@uber.com>
Jiacai Liu <jiacai2050@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jie Ma <jienius@outlook.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>
Jimmy Frasche <soapboxcicero@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londdevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>
Jiulong Wang <jiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>

Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>
Joe Shaw <joe@joeshaw.org>
Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Jansson <johan.jansson@iki.fi>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John McCabe <john@johnmccabe.net>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Papandriopoulos <jpap.code@gmail.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
John Weldon <johnweldon4@gmail.com>
Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jon Johnson <jonjohnson@google.com>
Jonas Bernoulli <jonas@bernoul.li>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>

Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kiefte <ikojba@gmail.com> <joop@kiefte.net>
Jordan Christiansen <xordspar0@gmail.com>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jorge L. Fatta <jorge.fatta@auth0.com>
Jos Visser <josv@google.com>
Josa Gesell <josa@gesell.me>
Jose Luis Vzquez Gonzalez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Baum <joshbaum@google.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Bezaleel Abednego <joshua.bezaleel@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Joshua Crowgey <jcrowgey@uw.edu>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhaug <js@solidsystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
JT Olio <hello@jtolio.com>
Juan Carlos <juanjcsr@gmail.com>

Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>
Julian Tibble <julian.tibble@gmail.com>
Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Jun Zhang <jim.zoumo@gmail.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>
Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmiller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kalman Bekesi <kalmanb@google.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Kanta Ebihara <kantaebihara@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katharine Berry <ktbry@google.com>
Katie Hockman <katie@golang.org>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>

Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keisuke Kishimoto <keisuke.kishimoto@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelly Heller <pestophagous@gmail.com>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Kerollos Magdy <kerolloz@yahoo.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevan Swanberg <kevswanberg@gmail.com>
Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kvin Dunglas <dunglas@gmail.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Keyan Pishdadian <kpishdadian@gmail.com>
Kezhu Wang <kezhuw@gmail.com>
Khosrow Moossavi <khos2ow@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Korotaev <kirillx@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>
Kirill Smelkov <kirr@nexedi.com>
Kirill Tatchihin <kirabsuir@gmail.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>

Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Koki Tomoshige <tomocy.dev@gmail.com>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Koya IWAMURA <kiwamura0314@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitijgaraogi@gmail.com>
Kun Li <likunarmstrong@gmail.com>
Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kush Patel <kush.patel@hootsuite.com>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Nusbaum <kyle@datadog.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>
Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Kyrolo Silin <silin@kyrolo.org>
L Campbell <unpansu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lanm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>
Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>

Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Liam Haworth <liam@haworth.id.au>
Lily Chung <lilithkchung@gmail.com>
Lion Yang <lion@aosc.xyz>
Liz Rice <liz@lizrice.com>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Brun <lorenz@brun.one>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>
Luca Greco <luca.greco@alcacoop.it>
Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luke Young <bored-engineer@users.noreply.github.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>
Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>
Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>

Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>
Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Sanmiquel <marcsanmiquel@gmail.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Weiner <marcus.weiner@gmail.com>
Marcus Willock <crazcalm@gmail.com>
Marga Manterola <marga@google.com>
Mariano Cano <mariano@smallstep.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>
Marius Nuennerich <mnu@google.com>
Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Kungla <marko.kungla@gmail.com>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>

Martin Asquino <martin.asquino@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>
Martin Kunc <martinkunc@users.noreply.github.com>
Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Masaya Watanabe <sfbgwm30@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>
Mt Gulys <mgulyas86@gmail.com>
Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>
Matt Layher <mdlayher@gmail.com>

Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdin.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Pugachev <pugachev.mm@gmail.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>
Maya Rashish <maya@NetBSD.org>
Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com> <mzh@golangcn.org>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszek <mknyszek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>
Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorner.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>

Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufel <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgraber <mteichgraber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <ziutek@inet.pl>
Michal Franc <lam.michal.franc@gmail.com>
Michałowicki <młowicki@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Acero <acero@google.com>
Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>
Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>

Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mike Tsao <mike@sowbug.com>
Mike Wiacek <mjwiacek@google.com>
Mikhail Fesenko <proggga@gmail.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milan Patel <bicelot3@gmail.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Mohit Verma <vmohit.93@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moritz Fain <moritz@fain.io>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mostyn Bramley-Moore <mostyn@antipode.se>
Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mukesh Sharma <sharma.mukesh439@gmail.com>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Naman Aggarwal <aggarwal.nam@gmail.com>
Nan Deng <monnand@gmail.com>
Nao Yonashiro <owan.orisano@gmail.com>
Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>

Nathan Caza <mastercactus@gmail.com>
Nathan Dias <nathan.dias@orijtech.com>
Nathan Fiscoletti <nathan.fiscoletti@vrazo.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otterness@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neeilan Selvalingam <neeilan96@gmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Gillmann <nikita@n0.is> <ng0@n0.is>

Nikita Kryuchkov <nkryuchkov10@gmail.com>
Nikita Vanyasin <nikita.vanyasin@gmail.com>
Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nikson Kanti Paul <nikson.sust@gmail.com>
Nils Larsgrd <nilsmagnus@gmail.com>
Nir Soffer <nirsof@gmail.com>
Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noah Goldman <noahg34@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>
Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Nuno Cruces <ncruces@users.noreply.github.com>
Obeyda Djefal <djefobey@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Powell <oliverpowell84@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogosoftware.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryanmoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Caderno <kaderno@gmail.com>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorpus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Panos Georgiadis <pgeorgiadis@suse.de>
Pantelis Sampaziotis <psampaz@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>

Pascal Dierich <pascal@pascaldierich.com>
Pascal S. de Kloe <pascal@quies.net>
Paschalis Tsilias <paschalis.tsilias@gmail.com>
Pasi Thkp <pasi.tahkapaa@gmail.com>
Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul D. Weber <x0bdev@gmail.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Paulo Gomes <paulo.gomes.uk@gmail.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Pei Xian Chee <luciolas1991@gmail.com>
Percy Wegmann <ox.to.a.cart@gmail.com>

Perry Abbott <perry.j.abbott@gmail.com>
Petar Dambovaliev <petar.atanasov.1987@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>
Peter Dotchev <dotchev@gmail.com>
Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>
Peter Nguyen <peter@mictis.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>
Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.borgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Carru <pierre.carru@eshard.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@hellopiers.pro>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Polina Osadcha <polliosa@google.com>

Pontus Leitzler <leitzler@gmail.com>
Povilas Versockas <p.versockas@gmail.com>
Prasanga Siripala <pj@pjjobs.com.au>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Agrawal <prashant.a.vjti@gmail.com>
Prashant Varanasi <prashant@prashantv.com>
Praveen Kumar <praveen+git@kumar.in>
Pravendra Singh <hackpravj@gmail.com>
Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quey-Liang Kao <s101062801@m101.nthu.edu.tw>
Quinn Slack <sq@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Ren Ogaki <re.yuz77777@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>

Ricardo Padilha <ricardospadilha@gmail.com>
Ricardo Seriani <ricardo.seriani@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Richard Ulmer <codesoap@mailbox.org>
Richard Wilkes <wilkes@me.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saareln <rsaareln@gmail.com>
Rob Earhart <earhart@google.com>
Rob Findley <rfindley@google.com>
Rob Norman <rob.norman@infinitycloud.com>
Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Kuska <rkuska@gmail.com>
Robert Obryk <robryk@gmail.com>
Robert Seseek <rseseek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Robin Zhong <robin@robinzhong.co>
Rodolfo Carvalho <rhcavalho@gmail.com>
Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Challa <rohan@golang.org>
Rohan Verma <rohanverma2004@gmail.com>

Rohith Ravi <entombedvirus@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bague <romain.bague@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Kollr <roman.kollar.0@gmail.com>
Roman Shchekin <mrqtros@gmail.com>
Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Kinsey <rossikinsey@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <ruiiu@google.com>
Ruixin Bao <ruixin.bao@ibm.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribrdb@google.com>
Ryan Canty <jrcanty@gmail.com>
Ryan Dahl <ry@tinyclouds.org>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>
Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Sakeven Jiang <jc5930@sina.cn>
Salmn Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>
Sam Boyer <tech@samboyer.org>
Sam Chen <chenxsan@gmail.com>
Sam Cross <samgcdev@gmail.com>
Sam Ding <samding@ca.ibm.com>

Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>
Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediaruna.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sardorbek Pulatov <sardorbek.pulatov@outlook.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Ragan <ragansa@fb.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Liao <seankhiao@gmail.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Chlopecki <sebsebmc@gmail.com>
Sebastian Kinne <skinne@google.com>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>
Seiji Takahashi <timaki.st@gmail.com>
Sergei Lemeshkin <sergeilem@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'Snake' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>

Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Glushchenko <gs serge@gmail.com>
Sergey Ivanov <ser1325@gmail.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>
Sergey Semin <gray12511@gmail.com>
Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhat Giydiren <serhatgydiren@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shang Jian Ding <sding3@ncsu.edu>
Shaozhen Ding <dsz0111@gmail.com>
Shaquille Wyan Que <shaqywyuan@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <sellott@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zs j950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shivashis Padhi <shivashispadhi@gmail.com>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simarpreet Singh <simar@linux.com>
Simon Drake <simondrake1990@gmail.com>
Simon Ferquel <simon.ferquel@docker.com>
Simon Jefford <simon.jefford@gmail.com>
Simon Rawet <simon@rawet.se>
Simon Rozman <simon@rozman.si>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>

Sina Siadat <siadat@gmail.com>
Sjoerd Siebinga <sjoerd.siebinga@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Soojin Nam <jsunam@gmail.com>
Sren L. Hansen <soren@linux2go.dk>
Spencer Kocot <spencerkocot@gmail.com>
Spencer Nelson <s@spenczar.com>
Spencer Tung <spencertung@google.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
Srinidhi Kaushik <shrinidhi.kaushik@gmail.com>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Rénatus <srenatus@chef.io>
Stephan Zuercher <zuercher@gmail.com>
Stéphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimistev@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littiebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>
Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>

Sunny <me@darkowlzz.space>
Suriyaa Sundararuban <suriyaasundararuban@gmail.com>
Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sven Taute <sven.taute@gmail.com>
Sylvain Zimmer <sylvain@sylvainzimmer.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>
Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Tadeo Kondrak <me@tadeo.ca>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tams Gulcsi <tgulacsi78@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Qingyun <qingyunha@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddotx.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>
The Hatsune Daishi <nao20010128@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>

Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>
Thomas Kappler <tkappler@gmail.com>
Thomas Meson <zllak@hycik.org>
Thomas Symborski <thomas.symborski@gmail.com>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianji Wu <the729@gmail.com>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>
Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Mhlmann <muhlemmer@gmail.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubeii@gmail.com>
Timmy Douglas <timmyd983@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>
Timothy Studd <tim@timstudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>
Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Parkin <tom.parkin@gmail.com>
Tom Payne <twpayne@gmail.com>

Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tomas Dabasinskas <tomas@dabasinskas.net>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomohiro Kusumoto <zabio1192@gmail.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>
Tonis Tiigi <tonistiigi@gmail.com>
Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Torben Schinke <torben.schinke@neotos.de>
Tormod Erevik Lea <tormodlea@gmail.com>
Toshihiro Shiino <shiino.toshihiro@gmail.com>
Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Oohry <oohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tsuji Daishiro <dram.dt.shonan@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tyson Andre <tysonandre775@gmail.com>
Tzach Shabtay <tzachshabtay@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangiparmar@gmail.com>
Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>

Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vee Zhang <veezhang@126.com> <vveezhang@gmail.com>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>
Viacheslav Poturaev <vearutop@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Ville Skytt <ville.skytta@iki.fi>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>
Visweswara R <r.visweswara@gmail.com>
Vitaly Zdanevich <zdanevich.vitaly@ya.ru>
Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vivian Liang <vliang88@gmail.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Evgrafov <evgrafov.vladimir@gmail.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Vladimir Varankin <nek.narqo@gmail.com>
Vojtech Bocek <vbocek@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgriffel@gmail.com>
Walt Della <walt@javins.net>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Wang Xuerui <git@xen0n.name>
Warren Fernandes <warren.f.fernandes@gmail.com>
Wayne Ashley Berry <wayneashleyberry@gmail.com>
Wedson Almeida Filho <wedsonaf@google.com>
Weerasak Chongnguluam <singpor@gmail.com>
Wi Cngru <crvv.mail@gmail.com>
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Wei Xiao <wei.xiao@arm.com>
Wei Xikai <xykwei@gmail.com>
Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>
Wil Selwood <wselwood@gmail.com>
Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
William Poussier <william.poussier@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xiangdong Ji <xiangdong.ji@arm.com>
Xing Xing <mikespook@gmail.com>
Xingqiang Bai <bxq2011hust@qq.com>
Xu Fei <badgangkiller@gmail.com>
Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Hau <vulxj0j8j8@gmail.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherv@gmail.com>
Yann Salan <yannsalaun1@gmail.com>
Yannic Bonenberger <contact@yannic-bonenberger.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yaroslav Vorobiov <yar.vorobiov@gmail.com>
Yasha Bubnov <girokompass@gmail.com>
Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>

Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <ylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>
Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>
Yorman Arias <cixtords@gmail.com>
Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>
Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuichi Kishimoto <yk2220s@gmail.com>
Yuichi Nishiwaki <yuichi.nishiwaki@gmail.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
Yukihiro Nishinaka <6elpinal@gmail.com>
Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zach Bintliff <zbintliff@gmail.com>
Zach Gershman <zachgersh@gmail.com>
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Zachary Amsden <zach@thundertoken.com>
Zachary Gershman <zgershman@pivotal.io>
Zak <zrjknill@gmail.com>
Zakatell Kanda <hi@zkanda.io>
Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>
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Zhang Boyang <zhangboyang.id@gmail.com>
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Zhongtao Chen <chenzhongtao@126.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Zhou Peng <p@ctruple.cn>
Ziad Hatahet <hatahet@gmail.com>
Ziheng Liu <lzhfromustc@gmail.com>
Zorion Arrizabalaga <zorionk@gmail.com>
<a.maksadbek@gmail.com>
<max.faceless.frei@gmail.com>
<hagen1778@gmail.com>

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1.366 libiconv 1.14

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[This is the first released version of the library GPL. It is
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The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The

former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

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A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file

that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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END OF TERMS AND CONDITIONS

Appendix: How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

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```
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library 'Frob' (a library for tweaking knobs) written by James Random Hacker.
```

```
<signature of Ty Coon>, 1 April 1990
```

Ty Coon, President of Vice

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Version 3, 29 June 2007

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Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS

0. Definitions.

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"Copyright" also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

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1. Source Code.

The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of a work.

A "Standard Interface" means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The "System Libraries" of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A "Major Component", in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The "Corresponding Source" for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work's System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for

the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

The Corresponding Source need not include anything that users can regenerate automatically from other parts of the Corresponding Source.

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```
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```

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This library provides an iconv() implementation, for use on systems which don't have one, or whose implementation cannot convert from/to Unicode.

It provides support for the encodings:

European languages

ASCII, ISO-8859-{1,2,3,4,5,7,9,10,13,14,15,16},
KOI8-R, KOI8-U, KOI8-RU,
CP{1250,1251,1252,1253,1254,1257}, CP{850,866,1131},
Mac{Roman,CentralEurope,Iceland,Croatian,Romania},
Mac{Cyrillic,Ukraine,Greek,Turkish},
Macintosh

Semitic languages

ISO-8859-{6,8}, CP{1255,1256}, CP862, Mac{Hebrew,Arabic}

Japanese

EUC-JP, SHIFT_JIS, CP932, ISO-2022-JP, ISO-2022-JP-2, ISO-2022-JP-1

Chinese

EUC-CN, HZ, GBK, CP936, GB18030, EUC-TW, BIG5, CP950, BIG5-HKSCS,
BIG5-HKSCS:2004, BIG5-HKSCS:2001, BIG5-HKSCS:1999, ISO-2022-CN,
ISO-2022-CN-EXT

Korean

EUC-KR, CP949, ISO-2022-KR, JOHAB

Armenian

ARMSCII-8

Georgian

Georgian-Academy, Georgian-PS

Tajik

KOI8-T

Kazakh

PT154, RK1048

Thai

ISO-8859-11, TIS-620, CP874, MacThai

Laotian

MuleLao-1, CP1133

Vietnamese

VISCII, TCVN, CP1258

Platform specifics

HP-ROMAN8, NEXTSTEP

Full Unicode

UTF-8
UCS-2, UCS-2BE, UCS-2LE

UCS-4, UCS-4BE, UCS-4LE
UTF-16, UTF-16BE, UTF-16LE
UTF-32, UTF-32BE, UTF-32LE
UTF-7
C99, JAVA

Full Unicode, in terms of 'uint16_t' or 'uint32_t'
(with machine dependent endianness and alignment)
UCS-2-INTERNAL, UCS-4-INTERNAL
Locale dependent, in terms of 'char' or 'wchar_t'
(with machine dependent endianness and alignment, and with OS and
locale dependent semantics)
char, wchar_t
The empty encoding name "" is equivalent to "char": it denotes the
locale dependent character encoding.

When configured with the option --enable-extra-encodings, it also provides
support for a few extra encodings:

European languages
CP{437,737,775,852,853,855,857,858,860,861,863,865,869,1125}
Semitic languages
CP864
Japanese
EUC-JISX0213, Shift_JISX0213, ISO-2022-JP-3
Chinese
BIG5-2003 (experimental)
Turkmen
TDS565
Platform specifics
ATARIST, RISCOS-LATIN1

It can convert from any of these encodings to any other, through Unicode
conversion.

It has also some limited support for transliteration, i.e. when a character
cannot be represented in the target character set, it can be approximated
through one or several similarly looking characters. Transliteration is
activated when "//TRANSLIT" is appended to the target encoding name.

libiconv is for you if your application needs to support multiple character
encodings, but that support lacks from your system.

Installation

As usual for GNU packages:

```
$ ./configure --prefix=/usr/local
$ make
$ make install
```

After installing GNU libiconv for the first time, it is recommended to recompile and reinstall GNU gettext, so that it can take advantage of libiconv.

On systems other than GNU/Linux, the iconv program will be internationalized only if GNU gettext has been built and installed before GNU libiconv. This means that the first time GNU libiconv is installed, we have a circular dependency between the GNU libiconv and GNU gettext packages, which can be resolved by building and installing either

- first libiconv, then gettext, then libiconv again,

or (on systems supporting shared libraries, excluding AIX)

- first gettext, then libiconv, then gettext again.

Recall that before building a package for the second time, you need to erase the traces of the first build by running "make distclean".

This library can be built and installed in two variants:

- The library mode. This works on all systems, and uses a library 'libiconv.so' and a header file '<iconv.h>'. (Both are installed through "make install".)

To use it, simply #include <iconv.h> and use the functions.

To use it in an autoconfiguring package:

- If you don't use automake, append m4/iconv.m4 to your aclocal.m4 file.
- If you do use automake, add m4/iconv.m4 to your m4 macro repository.
- Add to the link command line of libraries and executables that use the functions the placeholder @LIBICONV@ (or, if using libtool for the link, @LTLIBICONV@). If you use automake, the right place for these additions are the *_LDADD variables.

Note that 'iconv.m4' is also part of the GNU gettext package, which installs it in /usr/local/share/aclocal/iconv.m4.

- The libc plug/override mode. This works on GNU/Linux, Solaris and OSF/1 systems only. It is a way to get good iconv support without having glibc-2.1.

It installs a library 'preloadable_libiconv.so'. This library can be used with LD_PRELOAD, to override the iconv* functions present in the C library.

On GNU/Linux and Solaris:

```
$ export LD_PRELOAD=/usr/local/lib/preloadable_libiconv.so
```

On OSF/1:

```
$ export _RLD_LIST=/usr/local/lib/preloadable_libiconv.so:DEFAULT
```

A program's source need not be modified, the program need not even be recompiled. Just set the LD_PRELOAD environment variable, that's it!

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The libiconv and libcharset _libraries_ and their header files are under LGPL, see file COPYING.LIB.

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Download

<http://ftp.gnu.org/gnu/libiconv/libiconv-1.14.tar.gz>

Homepage

<http://www.gnu.org/software/libiconv/>

Bug reports to

<bug-gnu-libiconv@gnu.org>

Bruno Haible <bruno@clisp.org>

1.367 glibc 2.31-0ubuntu9.2

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1.368 icu 65

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## Commands to generate dependency files
GEN_DEPS.c= $(CC) -E -MM $(DEFS) $(CPPFLAGS)
GEN_DEPS.cc= $(CXX) -E -MM $(DEFS) $(CPPFLAGS)

## Flags for position independent code
SHAREDLIBCFLAGS = -fPIC
SHAREDLIBCXXFLAGS = -fPIC
SHAREDLIBCPPFLAGS = -DPIC

## Additional flags when building libraries and with threads
THREADSCPPFLAGS = -D_REENTRANT
LIBCPPFLAGS =

## Compiler switch to embed a runtime search path
LD_RPATH=
LD_RPATH_PRE= -Wl,-rpath,

## Compiler switch to embed a library name
LD_SONAME = -Wl,-soname -Wl,$(notdir $(MIDDLE_SO_TARGET))

## Shared library options
LD_SOOPTIONS= -Wl,-Bsymbolic

## Shared object suffix
SO = so

## Non-shared intermediate object suffix
STATIC_O = ao

## Compilation rules
%. $(STATIC_O): $(srcdir)/%.c
$(COMPILE.c) $(STATICCPPFLAGS) $(STATICCFLAGS) -o $@ $<
%.o: $(srcdir)/%.c
$(COMPILE.c) $(DYNAMICCPPFLAGS) $(DYNAMICCFLAGS) -o $@ $<

%. $(STATIC_O): $(srcdir)/%.cpp
$(COMPILE.cc) $(STATICCPPFLAGS) $(STATICCXXFLAGS) -o $@ $<
%.o: $(srcdir)/%.cpp
$(COMPILE.cc) $(DYNAMICCPPFLAGS) $(DYNAMICCXXFLAGS) -o $@ $<
```



```

## Dependency rules
%.d: $(srcdir)/%.c
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.c) $< \
| sed \"s^\($*\)\.o[ :]*^1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'

%.d: $(srcdir)/%.cpp
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.cc) $< \
| sed \"s^\($*\)\.o[ :]*^1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'

## Versioned libraries rules

%.${SO}.${SO_TARGET_VERSION_MAJOR}: %.${SO}.${SO_TARGET_VERSION}
$(RM) $@ && ln -s ${<F} $@
%.${SO}: %.${SO}.${SO_TARGET_VERSION_MAJOR}
$(RM) $@ && ln -s ${*F}.${SO}.${SO_TARGET_VERSION} $@

## Bind internal references

# LDflags that pkgdata will use
BIR_LDFLAGS= -Wl,-Bsymbolic

# Dependencies [i.e. map files] for the final library
BIR_DEPS=

## Remove shared library 's'
STATIC_PREFIX_WHEN_USED =
STATIC_PREFIX =

## End BSD-specific setup
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1.369 gettext 0.16.1

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Found in path(s):

```
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/ParameterizedType.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/Utils.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/FieldInfoGenerator.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/MethodInfoGenerator.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/ThrowsTypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/TypeParameterBoundTypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/EmptyTypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/PositionBasedTypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/TypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/AnnotationTargetFilterCollection.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
```

jar/org/jboss/jandex/IndexWriterImpl.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/TypeParameterTypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/VoidType.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/IndexReaderImpl.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/ArrayType.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/IndexWriterV2.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/ClassExtendsTypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/MethodParameterTypeTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/MethodInternal.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/WildcardType.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/GenericSignatureParser.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/TypeVariable.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/UnresolvedTypeVariable.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-
jar/org/jboss/jandex/IndexReaderV2.java

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*/
```

Found in path(s):

* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/PackedDataOutputStream.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/ClassInfo.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexWriter.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/DotName.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/FieldInternal.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/FieldInfo.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/NameTable.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/CompositeIndex.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexWriterV1.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexView.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/StrongInternPool.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Indexer.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/JarIndexer.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/JandexAntTask.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/MethodInfo.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/ClassType.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexReaderV1.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Result.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Index.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/MethodParameterInfo.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/UnsupportedVersion.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/AnnotationValue.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/AnnotationTarget.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/PrimitiveType.java

* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Main.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/PackedDataInputStream.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/AnnotationInstance.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexReader.java
* /opt/ws_local/PERMITS_SQL/1063930911_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Type.java

1.372 kubernetes-client 1.8.11

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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```
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```

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```
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under certain conditions; type `show c' for details.
```

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```
Yoyodyne, Inc., hereby disclaims all copyright interest in the program  
'Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
```

Ty Coon, President of Vice

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1.375 apr 1.6.5

1.376 cryptsetup 1.7.5

1.376.1 Available under license :

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Version 2.1, February 1999

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1.377 netty-handler-proxy 4.1.51.Final

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* /opt/ws_local/PERMITS_SQL/1077639653_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-
jar/io/netty/handler/proxy/HttpProxyHandler.java
* /opt/ws_local/PERMITS_SQL/1077639653_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-
jar/io/netty/handler/proxy/ProxyHandler.java
* /opt/ws_local/PERMITS_SQL/1077639653_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-
jar/io/netty/handler/proxy/package-info.java
* /opt/ws_local/PERMITS_SQL/1077639653_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-
jar/io/netty/handler/proxy/Socks4ProxyHandler.java
* /opt/ws_local/PERMITS_SQL/1077639653_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-
jar/io/netty/handler/proxy/ProxyConnectionEvent.java
* /opt/ws_local/PERMITS_SQL/1077639653_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-
jar/io/netty/handler/proxy/Socks5ProxyHandler.java
* /opt/ws_local/PERMITS_SQL/1077639653_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-
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1.378 protobuf 3.6.1.3-2ubuntu5

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Original Protocol Buffers design and implementation:

Sanjay Ghemawat <sanjay@google.com>

Jeff Dean <jeff@google.com>

Daniel Dulitz <daniel@google.com>

Craig Silverstein

Paul Haahr <haahr@google.com>

Corey Anderson <corin@google.com>

(and many others)

Proto2 C++ and Java primary author:

Kenton Varda <kenton@google.com>

Proto2 Python primary authors:

Will Robinson <robinson@google.com>

Petar Petrov <petar@google.com>

Java Nano primary authors:

Brian Duff <bduff@google.com>

Tom Chao <chaot@google.com>

Max Cai <maxtroy@google.com>

Ulas Kirazci <ulas@google.com>

Large code contributions:

Jason Hsueh <jasonh@google.com>

Joseph Schorr <jschorr@google.com>

Wenbo Zhu <wenboz@google.com>

Large quantity of code reviews:

Scott Bruce <sbruce@google.com>

Frank Yellin

Neal Norwitz <nnorwitz@google.com>

Jeffrey Yasskin <jyasskin@google.com>

Ambrose Feinstein <ambrose@google.com>

Documentation:

Lisa Carey <lcarey@google.com>

Maven packaging:

Gregory Kick <gak@google.com>

Patch contributors:

Kevin Ko <kevin.s.ko@gmail.com>

* Small patch to handle trailing slashes in --proto_path flag.

Johan Euphrosine <proppy@aminche.com>

* Small patch to fix Python CallMethod().

Ulrich Kunitz <kune@deine-taler.de>

* Small optimizations to Python serialization.

Leandro Lucarella <llucax@gmail.com>

* VI syntax highlighting tweaks.

* Fix compiler to not make output executable.

Dilip Joseph <dilip.antony.joseph@gmail.com>

* Heuristic detection of sub-messages when printing unknown fields in text format.

Brian Atkinson <nairb774@gmail.com>

* Added @Override annotation to generated Java code where appropriate.

Vincent Choinire <Choiniere.Vincent@hydro.qc.ca>

* Tru64 support.

Monty Taylor <monty.taylor@gmail.com>

* Solaris 10 + Sun Studio fixes.

Alek Storm <alek.storm@gmail.com>

* Slicing support for repeated scalar fields for the Python API.

Oleg Smolsky <oleg.smolsky@gmail.com>

* MS Visual Studio error format option.

* Detect unordered_map in stl_hash.m4.

Brian Olson <brianolson@google.com>

* gzip/zlib I/O support.

Michael Poole <mdpoole@troilus.org>

* Fixed warnings about generated constructors not explicitly initializing all fields (only present with certain compiler settings).

* Added generation of field number constants.

Wink Saville <wink@google.com>

- * Fixed initialization ordering problem in logging code.
- Will Pierce <willp@nuclei.com>
- * Small patch improving performance of in Python serialization.
- Alexandre Vassalotti <alexandre@peadrop.com>
- * Emacs mode for Protocol Buffers (editors/protobuf-mode.el).
- Scott Stafford <scott.stafford@gmail.com>
- * Added Swap(), SwapElements(), and RemoveLast() to Reflection interface.
- Alexander Melnikov <alm@sibmail.ru>
- * HPUX support.
- Oliver Jowett <oliver.jowett@gmail.com>
- * Detect whether zlib is new enough in configure script.
 - * Fixes for Solaris 10 32/64-bit confusion.
- Evan Jones <evanj@mit.edu>
- * Optimize Java serialization code when writing a small message to a stream.
 - * Optimize Java serialization of strings so that UTF-8 encoding happens only once per string per serialization call.
 - * Clean up some Java warnings.
 - * Fix bug with permanent callbacks that delete themselves when run.
- Michael Kucharski <m.kucharski@gmail.com>
- * Added CodedInputStream.getTotalBytesRead().
- Kacper Kowalik <xarthisius.kk@gmail.com>
- * Fixed m4/acx_pthread.m4 problem for some Linux distributions.
- William Orr <will@worrbase.com>
- * Fixed detection of sched_yield on Solaris.
 - * Added atomicops for Solaris
- Andrew Paprocki <andrew@ishiboo.com>
- * Fixed minor IBM xIC compiler build issues
 - * Added atomicops for AIX (POWER)

1.379 lvm2 2.02.162

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1.380 go-runtime 1.8

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Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandre Cesaro <alexandre.cesaro@gmail.com>
Alexandre Fiori <fiorix@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexis Imperial-Legrand <ail@google.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Amir Mohammad Saied <amir@gluegadget.com>
Amrut Joshi <amrut.joshi@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Lutomirski <andy@luto.us>
Andrew Pilloud <andrewpilloud@igneoussystem.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Szeto <andrew@jabagawee.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>
Andrew Wilkins <axwalk@gmail.com>
Andrew Williams <williams.andrew@gmail.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andriy Lytvynov <lytvynov.a.v@gmail.com>

Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Maloney <asmaloney@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anmol Sethi <anmol@aubble.com>
Anschel Schaffer-Cohen <anschelsc@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Martin <ality@pbrane.org>
Anthony Starks <ajstarks@gmail.com>
Anthony Woods <awoods@raintank.io>
Antonio Bibiano <antbbn@gmail.com>
Antonio Murdaca <runcom@redhat.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>
Areski Belaid <areski@gmail.com>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmani <art@a-30.net>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
awaw fumin <awawfumin@gmail.com>
Ayanamist Yang <ayanamist@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balazs Lecz <leczb@google.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Benjamin Black <b@b3k.us>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>

Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Thiede <couchmoney@gmail.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bobby Powers <bobbypowers@gmail.com>
Boris Nagaev <nagaev@google.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Gilmore <varz@google.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkennedy@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>

Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
ChaiShushan <chaishushan@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Cherry Zhang <cherryz@google.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>
Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Lennert <calennert@gmail.com>
Chris Manghane <cmang@golang.org>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clement Skau <clementska@gmail.com>
Colby Ranger <cranger@google.com>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Corey Thomasson <cthom.lists@gmail.com>
Cosmos Nicolaou <cnicolaou@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>

Cyrill Schumacher <cyrill@schumacher.fm>
Damian Gryski <dgryski@gmail.com>
Damien Neil <dneil@google.com>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daria Kolistratova <daria.kolistratova@intel.com>
Darren Elwood <darren@textnode.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>

David McLeish <davemc@google.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>
David Titarenco <david.titarenco@gmail.com>
Davies Liu <davies.liu@gmail.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Nagorny <denis.nagorny@intel.com>
Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek Parker <parkerderek86@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Didier Spezia <didier.06@gmail.com>
Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <shurcool@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Donald Huang <don.hcd@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Drew Hintz <adhintz@google.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>

Eden Li <eden.li@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eivind Uggedal <eivind@uggedal.com>
Elias Naur <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>
Emil Hessman <c.emil.hessman@gmail.com> <emil@hessman.se>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Eoghan Sherry <ejsherry@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Ewan Chou <coocood@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fatih Arslan <fatih@arslan.io>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Felix Geisendrfer <haimuiba@gmail.com>
Filippo Valsorda <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>

Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francisco Claude <fclaude@recoded.cl>
Francisco Souza <franciscossouza@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fumitoshi Ukai <ukai@google.com>
Gaal Yahas <gaal@google.com>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@aurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Geert-Johan Riemer <gjr19912@gmail.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>
Giulio Iotti <dullgiulio@gmail.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Greg Ward <greg@gerg.ca>
Guillaume J. Charmes <guillaume@charmest.net>
Guobiao Mei <meiguobiao@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
Han-Wen Nienhuys <hanwen@google.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>

Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hvard Haugen <havard.haugen@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Ian Gudger <ian@loosescre.ws>
Ian Lance Taylor <iant@golang.org>
Icarus Sparry <golang@icarus.freeuk.com>
Idora Shinatose <idora.shinatose@gmail.com>
Igor Bernstein <igorbernstein@google.com>
Igor Dolzhikov <bluesriverz@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Ivan Babrou <ivan@cloudflare.com>
Ivan Krasin <krasin@golang.org>
Ivan Ukhov <ivan.ukhov@gmail.com>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jae Kwon <jae@tendermint.com>
Jakob Borg <jakob@nym.se>
Jakub ajka <jcajka@redhat.com>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James David Chalfant <james.chalfant@gmail.com>

James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Meneghello <rawrz0r@gmail.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Mercl <0xjnml@gmail.com>
Jan Mercl <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jaroslavas Poepko <jp@webmaster.ms>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jay Weisskopf <jay@jayschwa.net>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jeff Craig <jeffcraig@google.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>

Jim McGrath <jimmc2@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jiong Du <londevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>
Joakim Sernbrant <serbaut@gmail.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Shaw <joe@joeshaw.org>
Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <jsing@google.com>
Joel Stemmer <stemmertech@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Newlin <jnewlin@google.com>
John Potocny <johnp@vividcortex.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
Jon Chen <jchen@justin.tv>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Wills <runningwild@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kieft <ikojba@gmail.com> <joop@kiefte.net>
Jordan Lewis <jordanthelewis@gmail.com>

Jos Visser <josv@google.com>
Jose Luis Vzquez Gonzlez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Jostein Stuhau <js@solidsystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Phillips <julian@quantumfyre.co.uk>
Julien Schmidt <google@julienschmidt.com>
Junggho Ahn <jhahn@google.com>
Jure Ham <jure.ham@zemanta.com>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kai Backman <kaib@golang.org>
Kale Blankenship <kale@lemnisis.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kang Hu <hukangustc@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>

Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kim Shrier <kshrier@racktopsystems.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kun Li <likunarmstrong@gmail.com>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
L Campbell <unpansu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Larry Hosken <lahosken@golang.org>
Larz Conwell <larzconwell@gmail.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Luca Greco <luca.greco@alcacoop.it>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luke Curley <qpingu@gmail.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>

Marcel van Lohuizen <mpvl@golang.org>
Marco Hennings <marco.hennings@freiheit.com>
Marga Manterola <marga@google.com>
Marin Bai <marin.basic02@gmail.com>
Marius Nuennerich <mnu@google.com>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Mikulicic <mkm@google.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Kreichgauer <martinkr@google.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsson <martin@minimum.se>
Marvin Stenger <marvin.stenger94@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mdbrown@google.com>
Matt Drollette <matt@drollette.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Layher <mdlayher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>

Max Riveiro <kavu13@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Ushakov <ushakov@google.com>
Maxwell Krohn <themax@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Chaten <mchaten@gmail.com>
Michael Darakananda <pongad@google.com>
Michael Elkins <michael.elkins@gmail.com>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kufel <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael Munday <munday@ca.ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgraber <mteichgraber@gmx.de> <mt4swm@googlemail.com>
Michael Vetter <g.bluehut@gmail.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <ziutek@inet.pl>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Mendez <stxmendez@gmail.com>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Rosset <mike.rosset@gmail.com>

Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Momchil Velikov <momchil.velikov@gmail.com>
Monty Taylor <mordred@inaugust.com>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mrunal Patel <mrunalp@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Nan Deng <monnand@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otternes@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>

Noah Campbell <noahcampbell@gmail.com>
Nodir Turakulov <nodir@google.com>
Norberto Lopes <nlopes.ml@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
zgr Kesim <oec-go@kesim.org>
Padraig Kitterick <padraigkitterick@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Pascal S. de Kloe <pascal@quies.net>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Chang <paulchang@google.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul Rosania <paul.rosania@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>

Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Collingbourne <pcc@google.com>
Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Mundy <go.peter.90@gmail.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.borgesen@gmail.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Varanasi <prashant@prashantv.com>
Preetam Jinka <pj@preet.am>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Smith <quentin@golang.org>
Quinn Slack <sq@sourcegraph.com>
Quoc-Viet Nguyen <afelion@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Rebecca Stambler <rstambler@golang.org>
Reinaldo de Souza Jr <juniorz@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Rhys Hiltner <rhys@justin.tv>

Ricardo Padilha <ricardospadilha@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saarelm <rsaarelm@gmail.com>
Rob Earhart <earhart@google.com>
Rob Norman <rob.norman@infinitycloud.com>
Rob Pike <r@golang.org>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Obryk <robryk@gmail.com>
Robert Sesek <rsesek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robin Eklind <r.eklind.87@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Roland Shoemaker <rolandshoemaker@gmail.com>
Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rui Ueyama <ruiiu@google.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Brown <ribrd@b@google.com>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sai Cheemalapati <saicheems@google.com>
Salmn Aljammz <s@0x65.net>

Sam Ding <samding@ca.ibm.com>
Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediaruna.net>
Sanjay Menakuru <balasanjay@gmail.com>
Sarah Adams <shadams@google.com>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Rees <sean@erifax.org>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergey 'Snake' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergio Luis O. B. Correia <sergio@correia.cc>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shaozhen Ding <dsz0111@gmail.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simon Jefford <simon.jefford@gmail.com>
Simon Rawet <simon@rawet.se>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>

Song Gao <song@gao.io>
Spencer Nelson <s@spenczar.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve McCoy <mccoyst@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimistev@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Suyash <dextrous93@gmail.com>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Tad Glines <tad.glines@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tamir Duberstein <tamird@gmail.com>
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Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>
Thomas Kappler <tkappler@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tilman Dilo <tilman.dilo@gmail.com>

Tim Cooijmans <timcooijmans@gmail.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
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Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
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Tom Wilkie <tom@weave.works>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tor Andersson <tor.andersson@gmail.com>
Tormod Erevik Lea <tormodlea@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Oohry <ooohry@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
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Uriel Mangado <uriel@berlinblue.org>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>

Vishvananda Ishaya <vishvananda@gmail.com>
Vitor De Mario <vitordemario@gmail.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
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Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
Walter Poupore <wpoupore@google.com>
Wedson Almeida Filho <wedsonaf@google.com>
Wei Guangjing <vcc.163@gmail.com>
Will Chan <willchan@google.com>
Will Norris <willnorris@google.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Josephson <wjosephson@gmail.com>
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Yesudeep Mangalapilly <yesudeep@google.com>
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Yongjian Xu <i3dmaster@gmail.com>
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Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuki Yugui Sonoda <yugui@google.com>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zev Goldstein <zev.goldstein@gmail.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Ziad Hatahet <hatahet@gmail.com>
Zorion Arrizabalaga <zorionk@gmail.com>
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1.381 spring-web-mvc 5.2.8.RELEASE

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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/UrlBasedViewResolverRegistration.java
* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/FlashMapManager.java
* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/support/SessionFlashMapManager.java
* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/form/PasswordInputTag.java
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/ArgumentAware.java
* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/document/AbstractXlsxView.java
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/resource/VersionStrategy.java
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*/  
/**  
* XSLT-driven View that allows for response context to be rendered as the  
* result of an XSLT transformation.  
*  
*/
```


* <p>The XSLT Source object is supplied as a parameter in the model and then
* { @link #locateSource detected} during response rendering. Users can either specify
* a specific entry in the model via the { @link #setSourceKey sourceKey} property or
* have Spring locate the Source object. This class also provides basic conversion
* of objects into Source implementations. See { @link #getSourceTypes() here}
* for more details.

*

* <p>All model parameters are passed to the XSLT Transformer as parameters.
* In addition the user can configure { @link #setOutputProperties output properties}
* to be passed to the Transformer.

*

* @author Rob Harrop
* @author Juergen Hoeller
* @since 2.0

*/

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 */
/**
 * A contract for inspecting and potentially modifying request data values such
 * as URL query parameters or form field values before they are rendered by a
 * view or before a redirect.
 *
 * <p>Implementations may use this contract for example as part of a solution
 * to provide data integrity, confidentiality, protection against cross-site
 * request forgery (CSRF), and others or for other tasks such as automatically
 * adding a hidden field to all forms and URLs.
 *
 * <p>View technologies that support this contract can obtain an instance to
 * delegate to via { @link RequestContext#getRequestDataValueProcessor()}.
 *
 * @author Rossen Stoyanchev
 * @since 3.1
 */
```

Found in path(s):

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/support/RequestDataValueProcessor.java

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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/condition/RequestCondition.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/InterceptorsBeanDefinitionParser.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/handler/MatchableHandlerMapping.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/ViewResolverComposite.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/WebMvcConfigurerAdapter.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/AbstractTemplateView.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/Controller.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/tiles3/SpringLocaleResolver.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/handler/RequestMatchResult.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/WebMvcConfigurerComposite.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/resource/ResourceTransformer.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/MvcNamespaceHandler.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/StreamingResponseBody.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/DefaultServletHandlerBeanDefinitionParser.java
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/UrlFilenameViewController.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/CorsRegistry.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/MvcUriComponentsBuilder.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/condition/RequestMethodRequestCondition.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/ContentNegotiationConfigurer.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/function/DefaultServerRequest.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/function/RequestPredicates.java

* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/i18n/AcceptHeaderLocaleResolver.java

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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
jar/org/springframework/web/servlet/mvc/method/annotation/ResponseBodyEmitterReturnValueHandler.java
* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
jar/org/springframework/web/servlet/function/ServerRequest.java

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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
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1.382 ehcache-core 3.8.1

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* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
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jar/org/ehcache/core/spi/LifeCycledAdapter.java
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* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/util/ClassLoading.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/spi/store/heap/package-info.java

1.383 glib 2.28.8

1.384 systemd 231

1.384.1 Available under license :

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1.385 libjpeg 6b

1.385.1 Notifications :

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1.385.2 Available under license :

The Independent JPEG Group's JPEG software

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README for release 6b of 27-Mar-1998

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This software is the work of Tom Lane, Philip Gladstone, Jim Boucher, Lee Crocker, Julian Minguillon, Luis Ortiz, George Phillips, Davide Rossi, Guido Vollbeding, Ge' Weijers, and other members of the Independent JPEG Group.

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DOCUMENTATION ROADMAP

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This file contains the following sections:

OVERVIEW General description of JPEG and the IJG software.
LEGAL ISSUES Copyright, lack of warranty, terms of distribution.
REFERENCES Where to learn more about JPEG.
ARCHIVE LOCATIONS Where to find newer versions of this software.
RELATED SOFTWARE Other stuff you should get.
FILE FORMAT WARS Software *not* to get.
TO DO Plans for future IJG releases.

Other documentation files in the distribution are:

User documentation:

install.doc How to configure and install the IJG software.
usage.doc Usage instructions for cjpeg, djpeg, jpegtran,
 rdjpgcom, and wrjpgcom.
*.1 Unix-style man pages for programs (same info as usage.doc).
wizard.doc Advanced usage instructions for JPEG wizards only.
change.log Version-to-version change highlights.

Programmer and internal documentation:

libjpeg.doc How to use the JPEG library in your own programs.
example.c Sample code for calling the JPEG library.
structure.doc Overview of the JPEG library's internal structure.
filelist.doc Road map of IJG files.
coderrules.doc Coding style rules --- please read if you contribute code.

Please read at least the files install.doc and usage.doc. Useful information can also be found in the JPEG FAQ (Frequently Asked Questions) article. See ARCHIVE LOCATIONS below to find out where to obtain the FAQ article.

If you want to understand how the JPEG code works, we suggest reading one or

more of the REFERENCES, then looking at the documentation files (in roughly the order listed) before diving into the code.

OVERVIEW

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This package contains C software to implement JPEG image compression and decompression. JPEG (pronounced "jay-peg") is a standardized compression method for full-color and gray-scale images. JPEG is intended for compressing "real-world" scenes; line drawings, cartoons and other non-realistic images are not its strong suit. JPEG is lossy, meaning that the output image is not exactly identical to the input image. Hence you must not use JPEG if you have to have identical output bits. However, on typical photographic images, very good compression levels can be obtained with no visible change, and remarkably high compression levels are possible if you can tolerate a low-quality image. For more details, see the references, or just experiment with various compression settings.

This software implements JPEG baseline, extended-sequential, and progressive compression processes. Provision is made for supporting all variants of these processes, although some uncommon parameter settings aren't implemented yet. For legal reasons, we are not distributing code for the arithmetic-coding variants of JPEG; see LEGAL ISSUES. We have made no provision for supporting the hierarchical or lossless processes defined in the standard.

We provide a set of library routines for reading and writing JPEG image files, plus two sample applications "cjpeg" and "djpeg", which use the library to perform conversion between JPEG and some other popular image file formats. The library is intended to be reused in other applications.

In order to support file conversion and viewing software, we have included considerable functionality beyond the bare JPEG coding/decoding capability; for example, the color quantization modules are not strictly part of JPEG decoding, but they are essential for output to colormapped file formats or colormapped displays. These extra functions can be compiled out of the library if not required for a particular application. We have also included "jpegtran", a utility for lossless transcoding between different JPEG processes, and "rdjpgcom" and "wrjpgcom", two simple applications for inserting and extracting textual comments in JFIF files.

The emphasis in designing this software has been on achieving portability and flexibility, while also making it fast enough to be useful. In particular, the software is not intended to be read as a tutorial on JPEG. (See the REFERENCES section for introductory material.) Rather, it is intended to be reliable, portable, industrial-strength code. We do not claim to have achieved that goal in every aspect of the software, but we strive for it.

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It appears that the arithmetic coding option of the JPEG spec is covered by patents owned by IBM, AT&T, and Mitsubishi. Hence arithmetic coding cannot legally be used without obtaining one or more licenses. For this reason, support for arithmetic coding has been removed from the free JPEG software. (Since arithmetic coding provides only a marginal gain over the unpatented Huffman mode, it is unlikely that very many implementations will support it.) So far as we are aware, there are no patent restrictions on the remaining code.

The IJG distribution formerly included code to read and write GIF files. To avoid entanglement with the Unisys LZW patent, GIF reading support has been removed altogether, and the GIF writer has been simplified to produce "uncompressed GIFs". This technique does not use the LZW algorithm; the resulting GIF files are larger than usual, but are readable by all standard GIF decoders.

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REFERENCES

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We highly recommend reading one or more of these references before trying to

understand the innards of the JPEG software.

The best short technical introduction to the JPEG compression algorithm is Wallace, Gregory K. "The JPEG Still Picture Compression Standard", Communications of the ACM, April 1991 (vol. 34 no. 4), pp. 30-44. (Adjacent articles in that issue discuss MPEG motion picture compression, applications of JPEG, and related topics.) If you don't have the CACM issue handy, a PostScript file containing a revised version of Wallace's article is available at <ftp://ftp.uu.net/graphics/jpeg/wallace.ps.gz>. The file (actually a preprint for an article that appeared in IEEE Trans. Consumer Electronics) omits the sample images that appeared in CACM, but it includes corrections and some added material. Note: the Wallace article is copyright ACM and IEEE, and it may not be used for commercial purposes.

A somewhat less technical, more leisurely introduction to JPEG can be found in "The Data Compression Book" by Mark Nelson and Jean-loup Gailly, published by M&T Books (New York), 2nd ed. 1996, ISBN 1-55851-434-1. This book provides good explanations and example C code for a multitude of compression methods including JPEG. It is an excellent source if you are comfortable reading C code but don't know much about data compression in general. The book's JPEG sample code is far from industrial-strength, but when you are ready to look at a full implementation, you've got one here...

The best full description of JPEG is the textbook "JPEG Still Image Data Compression Standard" by William B. Pennebaker and Joan L. Mitchell, published by Van Nostrand Reinhold, 1993, ISBN 0-442-01272-1. Price US\$59.95, 638 pp. The book includes the complete text of the ISO JPEG standards (DIS 10918-1 and draft DIS 10918-2). This is by far the most complete exposition of JPEG in existence, and we highly recommend it.

The JPEG standard itself is not available electronically; you must order a paper copy through ISO or ITU. (Unless you feel a need to own a certified official copy, we recommend buying the Pennebaker and Mitchell book instead; it's much cheaper and includes a great deal of useful explanatory material.) In the USA, copies of the standard may be ordered from ANSI Sales at (212) 642-4900, or from Global Engineering Documents at (800) 854-7179. (ANSI doesn't take credit card orders, but Global does.) It's not cheap: as of 1992, ANSI was charging \$95 for Part 1 and \$47 for Part 2, plus 7% shipping/handling. The standard is divided into two parts, Part 1 being the actual specification, while Part 2 covers compliance testing methods. Part 1 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 1: Requirements and guidelines" and has document numbers ISO/IEC IS 10918-1, ITU-T T.81. Part 2 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 2: Compliance testing" and has document numbers ISO/IEC IS 10918-2, ITU-T T.83.

Some extensions to the original JPEG standard are defined in JPEG Part 3, a newer ISO standard numbered ISO/IEC IS 10918-3 and ITU-T T.84. IJG

currently does not support any Part 3 extensions.

The JPEG standard does not specify all details of an interchangeable file format. For the omitted details we follow the "JFIF" conventions, revision 1.02. A copy of the JFIF spec is available from:

Literature Department
C-Cube Microsystems, Inc.
1778 McCarthy Blvd.
Milpitas, CA 95035
phone (408) 944-6300, fax (408) 944-6314

A PostScript version of this document is available by FTP at <ftp://ftp.uu.net/graphics/jpeg/jfif.ps.gz>. There is also a plain text version at <ftp://ftp.uu.net/graphics/jpeg/jfif.txt.gz>, but it is missing the figures.

The TIFF 6.0 file format specification can be obtained by FTP from <ftp://ftp.sgi.com/graphics/tiff/TIFF6.ps.gz>. The JPEG incorporation scheme found in the TIFF 6.0 spec of 3-June-92 has a number of serious problems. IJG does not recommend use of the TIFF 6.0 design (TIFF Compression tag 6). Instead, we recommend the JPEG design proposed by TIFF Technical Note #2 (Compression tag 7). Copies of this Note can be obtained from <ftp.sgi.com> or from <ftp://ftp.uu.net/graphics/jpeg/>. It is expected that the next revision of the TIFF spec will replace the 6.0 JPEG design with the Note's design. Although IJG's own code does not support TIFF/JPEG, the free libtiff library uses our library to implement TIFF/JPEG per the Note. libtiff is available from <ftp://ftp.sgi.com/graphics/tiff/>.

ARCHIVE LOCATIONS

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The "official" archive site for this software is <ftp.uu.net> (Internet address 192.48.96.9). The most recent released version can always be found there in directory <graphics/jpeg>. This particular version will be archived as <ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz>. If you don't have direct Internet access, UUNET's archives are also available via UUCP; contact help@uunet.uu.net for information on retrieving files that way.

Numerous Internet sites maintain copies of the UUNET files. However, only <ftp.uu.net> is guaranteed to have the latest official version.

You can also obtain this software in DOS-compatible "zip" archive format from the SimTel archives (<ftp://ftp.simtel.net/pub/simtelnet/msdos/graphics/>), or on CompuServe in the Graphics Support forum (GO CIS:GRAPHSUP), library 12 "JPEG Tools". Again, these versions may sometimes lag behind the <ftp.uu.net> release.

The JPEG FAQ (Frequently Asked Questions) article is a useful source of

general information about JPEG. It is updated constantly and therefore is not included in this distribution. The FAQ is posted every two weeks to Usenet newsgroups comp.graphics.misc, news.answers, and other groups. It is available on the World Wide Web at <http://www.faqs.org/faqs/jpeg-faq/> and other news.answers archive sites, including the official news.answers archive at rtfm.mit.edu: <ftp://rtfm.mit.edu/pub/usenet/news.answers/jpeg-faq/>. If you don't have Web or FTP access, send e-mail to mail-server@rtfm.mit.edu with body

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RELATED SOFTWARE

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Numerous viewing and image manipulation programs now support JPEG. (Quite a few of them use this library to do so.) The JPEG FAQ described above lists some of the more popular free and shareware viewers, and tells where to obtain them on Internet.

If you are on a Unix machine, we highly recommend Jef Poskanzer's free PBPLUS software, which provides many useful operations on PPM-format image files. In particular, it can convert PPM images to and from a wide range of other formats, thus making cjpeg/djpeg considerably more useful. The latest version is distributed by the NetPBM group, and is available from numerous sites, notably <ftp://wuarchive.wustl.edu/graphics/graphics/packages/NetPBM/>. Unfortunately PBPLUS/NETPBM is not nearly as portable as the IJG software is; you are likely to have difficulty making it work on any non-Unix machine.

A different free JPEG implementation, written by the PVRG group at Stanford, is available from <ftp://havefun.stanford.edu/pub/jpeg/>. This program is designed for research and experimentation rather than production use; it is slower, harder to use, and less portable than the IJG code, but it is easier to read and modify. Also, the PVRG code supports lossless JPEG, which we do not. (On the other hand, it doesn't do progressive JPEG.)

FILE FORMAT WARS

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Some JPEG programs produce files that are not compatible with our library. The root of the problem is that the ISO JPEG committee failed to specify a concrete file format. Some vendors "filled in the blanks" on their own, creating proprietary formats that no one else could read. (For example, none of the early commercial JPEG implementations for the Macintosh were able to exchange compressed files.)

The file format we have adopted is called JFIF (see REFERENCES). This format

has been agreed to by a number of major commercial JPEG vendors, and it has become the de facto standard. JFIF is a minimal or "low end" representation. We recommend the use of TIFF/JPEG (TIFF revision 6.0 as modified by TIFF Technical Note #2) for "high end" applications that need to record a lot of additional data about an image. TIFF/JPEG is fairly new and not yet widely supported, unfortunately.

The upcoming JPEG Part 3 standard defines a file format called SPIFF. SPIFF is interoperable with JFIF, in the sense that most JFIF decoders should be able to read the most common variant of SPIFF. SPIFF has some technical advantages over JFIF, but its major claim to fame is simply that it is an official standard rather than an informal one. At this point it is unclear whether SPIFF will supersede JFIF or whether JFIF will remain the de-facto standard. IJG intends to support SPIFF once the standard is frozen, but we have not decided whether it should become our default output format or not. (In any case, our decoder will remain capable of reading JFIF indefinitely.)

Various proprietary file formats incorporating JPEG compression also exist. We have little or no sympathy for the existence of these formats. Indeed, one of the original reasons for developing this free software was to help force convergence on common, open format standards for JPEG files. Don't use a proprietary file format!

TO DO

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The major thrust for v7 will probably be improvement of visual quality. The current method for scaling the quantization tables is known not to be very good at low Q values. We also intend to investigate block boundary smoothing, "poor man's variable quantization", and other means of improving quality-vs-file-size performance without sacrificing compatibility.

In future versions, we are considering supporting some of the upcoming JPEG Part 3 extensions --- principally, variable quantization and the SPIFF file format.

As always, speeding things up is of great interest.

Please send bug reports, offers of help, etc. to jpeg-info@uunet.uu.net.

1.386 runc 1.0.0-rc9

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- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ReferenceCountedOpenSslServerContext.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PemX509Certificate.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/flow/package-info.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ReferenceCountedOpenSslClientContext.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ReferenceCountedOpenSslEngine.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PemEncoded.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PemValue.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/X509TrustManagerWrapper.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/flush/package-info.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/Java8SslUtils.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslCertificateException.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ReferenceCountedOpenSslContext.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/flush/FlushConsolidationHandler.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/DelegatingSslContext.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslKeyMaterialManager.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ocsp/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/AbstractSniHandler.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslCompletionEvent.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslCloseCompletionEvent.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/Conscrypt.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SniCompletionEvent.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OptionalSslHandler.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkAlpnSslUtils.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkAlpnSslEngine.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslClientHelloHandler.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ConscryptAlpnSslEngine.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslSessionTicketKey.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ClientAuth.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolNegotiationHandler.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/package-info.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/NotSslRecordException.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslHandler.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedFile.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedNioStream.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/logging/LogLevel.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-

jar/io/netty/handler/stream/ChunkedWriteHandler.java
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jar/io/netty/handler/stream/ChunkedInput.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-
jar/io/netty/handler/timeout/ReadTimeoutException.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-
jar/io/netty/handler/timeout/TimeoutException.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-
jar/io/netty/handler/timeout/IdleStateEvent.java
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jar/io/netty/handler/timeout/WriteTimeoutException.java
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jar/io/netty/handler/stream/package-info.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SniHandler.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslX509Certificate.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/Java7SslParametersUtils.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslSessionStats.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkApplicationProtocolNegotiator.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SupportedCipherSuiteFilter.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JettyNpnSslEngine.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslEngineMap.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslContext.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslDefaultApplicationProtocolNegotiator.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/RuleBasedIpFilter.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkAlpnApplicationProtocolNegotiator.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslServerContext.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkDefaultApplicationProtocolNegotiator.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslProvider.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/IdentityCipherSuiteFilter.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/OpenJdkSelfSignedCertGenerator.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslContext.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/ThreadLocalInsecureRandom.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolConfig.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/UniqueIpFilter.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslApplicationProtocolNegotiator.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslServerSessionContext.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkNpnApplicationProtocolNegotiator.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolUtil.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpSubnetFilterRule.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpFilterRule.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslUtils.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpFilterRuleType.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JettyAlpnSslEngine.java

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Please keep the list sorted.

Albert Pretorius <pretoalb@gmail.com>

Arne Beer <arne@twobeer.de>

Billy Robert O'Neal III <billy.oneal@gmail.com> <bion@microsoft.com>

Chris Kennelly <ckennelly@google.com> <ckennelly@ckennelly.com>

Christopher Seymour <chris.j.seymour@hotmail.com>

David Coeurjolly <david.coeurjolly@liris.cnrs.fr>
Deniz Evrenci <denizevrenci@gmail.com>
Dominic Hamon <dma@stripysock.com> <dominic@google.com>
Dominik Czarnota <dominik.b.czarnota@gmail.com>
Eric Fiselier <eric@efcs.ca>
Eugene Zhuk <eugene.zhuk@gmail.com>
Evgeny Safronov <division494@gmail.com>
Felix Homann <linuxaudio@showlabor.de>
Ismael Jimenez Martinez <ismael.jimenez.martinez@gmail.com>
Jern-Kuan Leong <jernkuan@gmail.com>
JianXiong Zhou <zhoujianxiong2@gmail.com>
Joao Paulo Magalhaes <joaoppmagalhaes@gmail.com>
John Millikin <jmillikin@stripe.com>
Jussi Knuutila <jussi.knuutila@gmail.com>
Kai Wolf <kai.wolf@gmail.com>
Kishan Kumar <kumar.kishan@outlook.com>
Kaito Udagawa <umireon@gmail.com>
Lei Xu <eddyxu@gmail.com>
Matt Clarkson <mattyclarkson@gmail.com>
Maxim Vafin <maxvafin@gmail.com>
Nick Hutchinson <nshutchinson@gmail.com>
Oleksandr Sochka <sasha.sochka@gmail.com>
Pascal Leroy <phl@google.com>
Paul Redmond <paul.redmond@gmail.com>
Pierre Phaneuf <pphaneuf@google.com>
Radoslav Yovchev <radoslav.tm@gmail.com>
Raul Marin <rmrodriguez@cartodb.com>
Ray Glover <ray.glover@uk.ibm.com>
Robert Guo <robert.guo@mongodb.com>
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Upstream-Contact: Andy Cress <arcress at users.sourceforge.net>
Source: <http://ipmiutil.sourceforge.net>
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jpg "Clone me," says Dolly sheepishly.

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The following individuals contributed in part to the Network Time
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 work.

1. [1]Takao Abe <takao_abe@xurb.jp> Clock driver for JJY receivers
2. [2]Mark Andrews <mark_andrews@isc.org> Leitch atomic clock controller
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 17. [18]Torsten Duwe <duwe@immd4.informatik.uni-erlangen.de> Linux port
 18. [19]Dennis Ferguson <dennis@mrbill.canet.ca> foundation code for NTP Version 2 as specified in RFC-1119
 19. [20]John Hay <jhay@icomtek.csir.co.za> IPv6 support and testing
 20. [21]Dave Hart <davehart@davehart.com> General maintenance, Windows port interpolation rewrite
 21. [22]Claas Hilbrecht <neoclock4x@linum.com> NeoClock4X clock driver
 22. [23]Glenn Hollinger <glenn@herald.usask.ca> GOES clock driver
 23. [24]Mike Iglesias <iglesias@uci.edu> DEC Alpha port
 24. [25]Jim Jagielski <jim@jagubox.gsfc.nasa.gov> A/UX port
 25. [26]Jeff Johnson <jbj@chatham.usdesign.com> massive prototyping overhaul
 26. [27]Hans Lambermont <Hans.Lambermont@nl.origin-it.com> or [28]<H.Lambermont@chello.nl> ntpsweep
 27. [29]Poul-Henning Kamp <phk@FreeBSD.ORG> Oncore driver (Original author)
 28. [30]Frank Kardel [31]<kardel (at) ntp (dot) org> PARSE <GENERIC> (driver 14 reference clocks), STREAMS modules for PARSE, support scripts, syslog cleanup, dynamic interface handling
 29. [32]Johannes Maximilian Kuehn <kuehn@ntp.org> Rewrote snpt to comply with NTPv4 specification, ntpq saveconfig
 30. [33]William L. Jones <jones@hermes.chpc.utexas.edu> RS/6000 AIX modifications, HPUX modifications
 31. [34]Dave Katz <dkatz@cisco.com> RS/6000 AIX port
 32. [35]Craig Leres <leres@ee.lbl.gov> 4.BSD port, ppsclock, Magnavox GPS clock driver
 33. [36]George Lindholm <lindholm@ucs.ubc.ca> SunOS 5.1 port

34. [37]Louis A. Mamakos <louie@ni.umd.edu> MD5-based authentication
35. [38]Lars H. Mathiesen <thorinn@diku.dk> adaptation of foundation code for Version 3 as specified in RFC-1305
36. [39]Danny Mayer <mayer@ntp.org>Network I/O, Windows Port, Code Maintenance
37. [40]David L. Mills <mills@udel.edu> Version 4 foundation, precision kernel; clock drivers: 1, 3, 4, 6, 7, 11, 13, 18, 19, 22, 36
38. [41]Wolfgang Moeller <moeller@gwdgv1.dnet.gwdg.de> VMS port
39. [42]Jeffrey Mogul <mogul@pa.dec.com> ntptrace utility
40. [43]Tom Moore <tmoore@fieval.daytonoh.ncr.com> i386 svr4 port
41. [44]Kamal A Mostafa <kamal@whence.com> SCO OpenServer port
42. [45]Derek Mulcahy <derek@toybox.demon.co.uk> and [46]Damon Hart-Davis <d@hd.org> ARCRON MSF clock driver
43. [47]Rob Neal <neal@ntp.org> Bancomm refclock and config/parse code maintenance
44. [48]Rainer Pruy <Rainer.Pruy@informatik.uni-erlangen.de> monitoring/trap scripts, statistics file handling
45. [49]Dirce Richards <dirce@zk3.dec.com> Digital UNIX V4.0 port
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47. [51]Nick Sayer <mrapple@quack.kfu.com> SunOS streams modules
48. [52]Jack Sasportas <jack@innovativeinternet.com> Saved a Lot of space on the stuff in the html/pic/ subdirectory
49. [53]Ray Schnitzler <schnitz@unipress.com> Unixware1 port
50. [54]Michael Shields <shields@tembel.org> USNO clock driver
51. [55]Jeff Steinman <jss@pebbles.jpl.nasa.gov> Datum PTS clock driver
52. [56]Harlan Stenn <harlan@pfcs.com> GNU automake/autoconfigure makeover, various other bits (see the ChangeLog)
53. [57]Kenneth Stone <ken@sdd.hp.com> HP-UX port
54. [58]Ajit Thyagarajan <ajit@ee.udel.edu>IP multicast/anycast support
55. [59]Tomoaki TSURUOKA <tsuruoka@nc.fukuoka-u.ac.jp>TRAK clock driver
56. [60]Brian Utterback <brian.utterback@oracle.com> General codebase, Solaris issues
57. [61]Loganaden Velvindron <loganaden@gmail.com> Sandboxing (libseccomp) support
58. [62]Paul A Vixie <vixie@vix.com> TrueTime GPS driver, generic TrueTime clock driver
59. [63]Ulrich Windl <Ulrich.Windl@rz.uni-regensburg.de> corrected and validated HTML documents according to the HTML DTD

References

1. mailto:%20takao_abe@xurb.jp
2. mailto:%20mark_andrews@isc.org
3. <mailto:%20altmeier@atsoft.de>
4. <mailto:%20vbais@mailman1.intel.co>
5. <mailto:%20kirkwood@striderfm.intel.com>
6. <mailto:%20michael.barone@lmco.com>

7. mailto:%20karl@owl.HQ.ileaf.com
8. mailto:%20greg.brackley@bigfoot.com
9. mailto:%20Marc.Brett@westgeo.com
10. mailto:%20Piete.Brooks@cl.cam.ac.uk
11. mailto:%20nelson@bolyard.me
12. mailto:%20Jean-Francois.Boudreault@viagenie.qc.ca
13. mailto:%20reg@dwf.com
14. mailto:%20clift@ml.csiro.au
15. mailto:%20casey@csc.co.za
16. mailto:%20Sven_Dietrich@trimble.COM
17. mailto:%20dundas@salt.jpl.nasa.gov
18. mailto:%20duwe@immd4.informatik.uni-erlangen.de
19. mailto:%20dennis@mrbill.canet.ca
20. mailto:%20jhay@icomtek.csir.co.za
21. mailto:%20davehart@davehart.com
22. mailto:%20neoclock4x@linum.com
23. mailto:%20glenn@herald.usask.ca
24. mailto:%20iglesias@uci.edu
25. mailto:%20jagubox.gsfc.nasa.gov
26. mailto:%20jbj@chatham.usdesign.com
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34. mailto:%20dkatz@cisco.com
35. mailto:%20leres@ee.lbl.gov
36. mailto:%20lindholm@ucs.ubc.ca
37. mailto:%20louie@ni.umd.edu
38. mailto:%20thorinn@diku.dk
39. mailto:%20mayer@ntp.org
40. mailto:%20mills@udel.edu
41. mailto:%20moeller@gwdgv1.dnet.gwdg.de
42. mailto:%20mogul@pa.dec.com
43. mailto:%20tmoore@fievel.daytonoh.ncr.com
44. mailto:%20kamal@whence.com
45. mailto:%20derek@toybox.demon.co.uk
46. mailto:%20d@hd.org
47. mailto:%20neal@ntp.org
48. mailto:%20Rainer.Pruy@informatik.uni-erlangen.de
49. mailto:%20dirce@zk3.dec.com
50. mailto:%20wsanchez@apple.com
51. mailto:%20mrapple@quack.kfu.com
52. mailto:%20jack@innovativeinternet.com
53. mailto:%20schnittz@unipress.com
54. mailto:%20shields@tembel.org

- 55. mailto:%20pebbles.jpl.nasa.gov
- 56. mailto:%20harlan@pfcs.com
- 57. mailto:%20ken@sdd.hp.com
- 58. mailto:%20ajit@ee.udel.edu
- 59. mailto:%20tsuruoka@nc.fukuoka-u.ac.jp
- 60. mailto:%20brian.utterback@oracle.com
- 61. mailto:%20loganaden@gmail.com
- 62. mailto:%20vixie@vix.com
- 63. mailto:%20Ulrich.Windl@rz.uni-regensburg.de

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1.402 util-linux 2.34 0.1ubuntu9.1

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```
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This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
```

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```
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```

```
<signature of Ty Coon>, 1 April 1989
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87I8.mhGl^eb_X/UQKuB

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;*!;_>KfBqxY(F|0.Ve%S61opMG`YfRXvY[R+t[BS=)d

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Here the stream cipher has been modified always to include the time when initializing the state. That makes it impossible to regenerate the same random sequence twice, so this can't be used for encryption, but will generate good random numbers.

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- web-app_3_1.xsd
- web-common_3_1.xsd
- web-fragment_3_1.xsd
- javaee_8.xsd
- web-app_4_0.xsd
- web-common_4_0.xsd
- web-fragment_4_0.xsd

may be obtained from:

<http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/index.html>

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Version 2.0, January 2004

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- javaee_web_services_client_1_2.xsd
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- web-common_3_0.xsd
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- javaee_web_services_client_1_4.xsd
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- javaee_web_services_1_3.xsd
- javaee_web_services_client_1_3.xsd
- jsp_2_2.xsd
- web-app_3_0.xsd
- web-common_3_0.xsd
- web-fragment_3_0.xsd
- javaee_7.xsd
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- jsp_2_2.xsd
- web-app_3_0.xsd
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- javaee_7.xsd
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- web-common_3_1.xsd
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- javaee_web_services_client_1_2.xsd
- javaee_6.xsd
- javaee_web_services_1_3.xsd
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- * /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAuthScheme.java
- * /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdStatus.java
- * /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksRequestType.java
- * /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdType.java
- * /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksResponseType.java
- * /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksMessageType.java
- * /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAddressType.java
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jar/io/netty/handler/codec/socks/SocksCmdResponseDecoder.java
* /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-
jar/io/netty/handler/codec/socksx/v5/Socks5PasswordAuthRequest.java
* /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-
jar/io/netty/handler/codec/socksx/v5/Socks5CommandResponse.java
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jar/io/netty/handler/codec/socksx/v5/DefaultSocks5InitialRequest.java
* /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-

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jar/io/netty/handler/codec/socks/SocksMessageEncoder.java
* /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-
jar/io/netty/handler/codec/socksx/v4/Socks4CommandStatus.java
* /opt/ws_local/PERMITS_SQL/1077639554_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-
jar/io/netty/handler/codec/socks/package-info.java
```

1.406 boost 1.67.0

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SHA224, SHA256, SHA384, and SHA512

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1.408 Isof 4.85

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1.409 statistics 2.1

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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1.412 jq 1.6-1

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1.413 xorg-randr 1.5.0

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1.414 cyrus-sasl 2.1.27+dfsg-2

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